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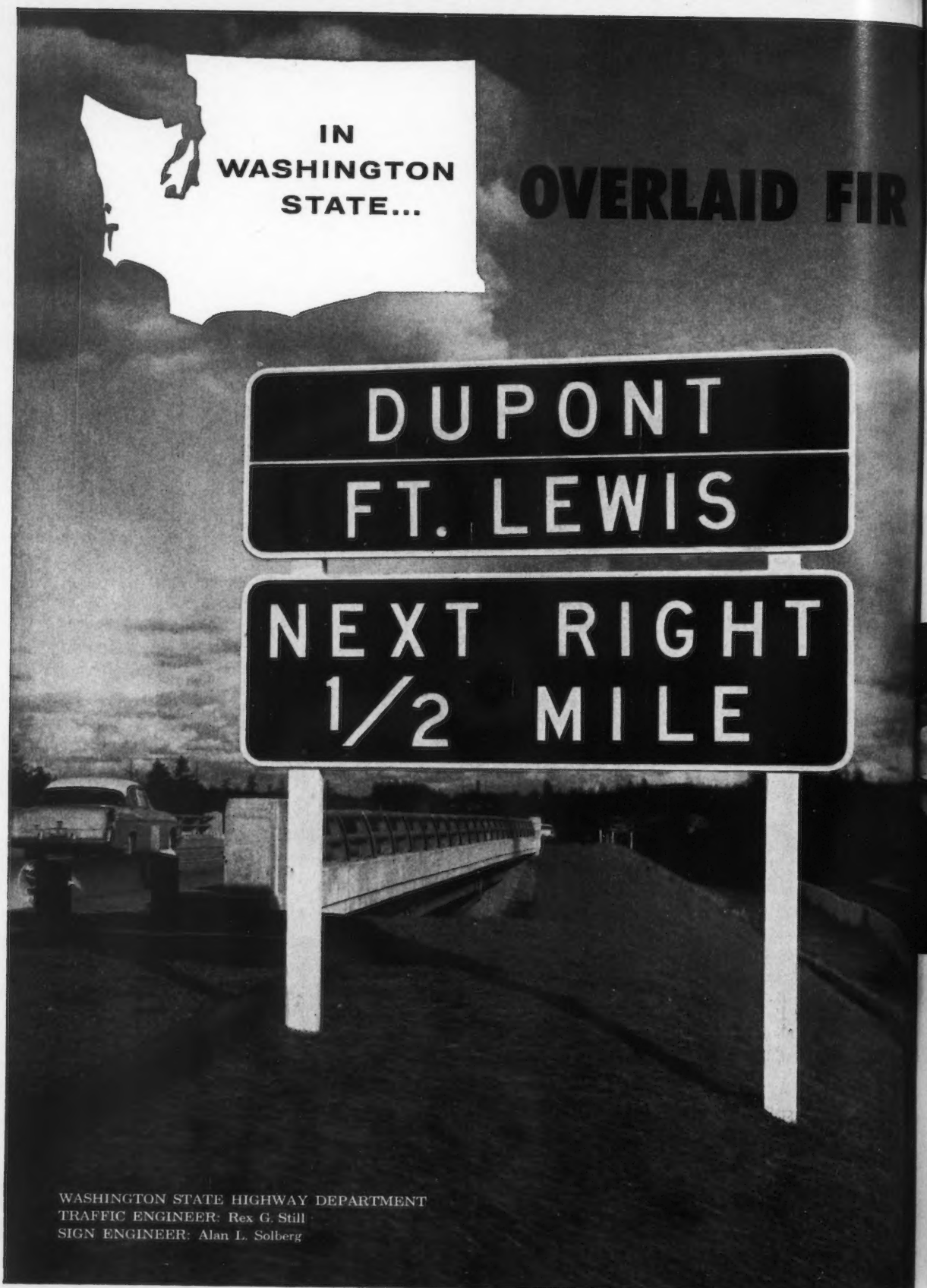

WASHINGTON STATE HIGHWAY DEPARTMENT
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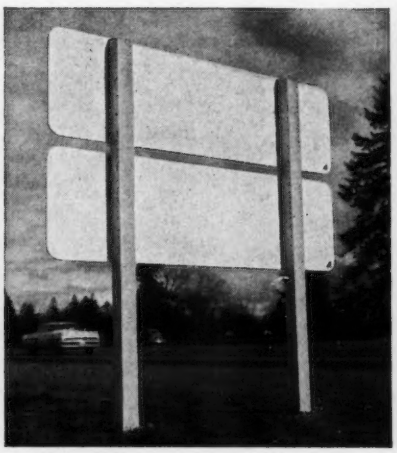

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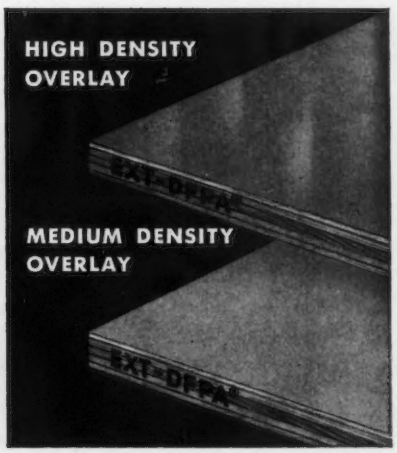

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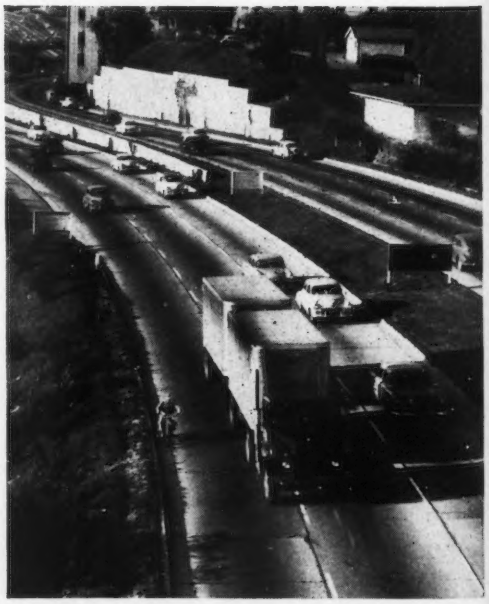

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TRAFFIC ENGINEERING

OFFICIAL PUBLICATION OF THE INSTITUTE OF TRAFFIC ENGINEERS

Vol. 28 APRIL, 1958 Number 7

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COVER: North Olmstead-Cleveland Interchange on the Ohio Turnpike.
—Photo courtesy Ohio Turnpike Commission

TRAFFIC ENGINEERING is published monthly by the Institute of Traffic Engineers. Editorial offices are at 2029 K Street NW, Washington 6, D.C. Advertising plates should be sent to Interstate Printing Corp., 400 Watchung Avenue, Plainfield, N. J. For advertising information other than California, address Traffic Engineering, 2029 K Street NW, Washington 6, D.C. For California information, address Jess M. Laughlin Co., 3757 Wilshire Blvd., Los Angeles 5, Calif.

Entered as second-class matter November 7, 1941, at the Post Office at Plainfield, New Jersey, under Act of March 3, 1879. ¶Single copies 40 cents, subscription price $3.50 per year in the United States and Canada; $4.75 per year to foreign countries.

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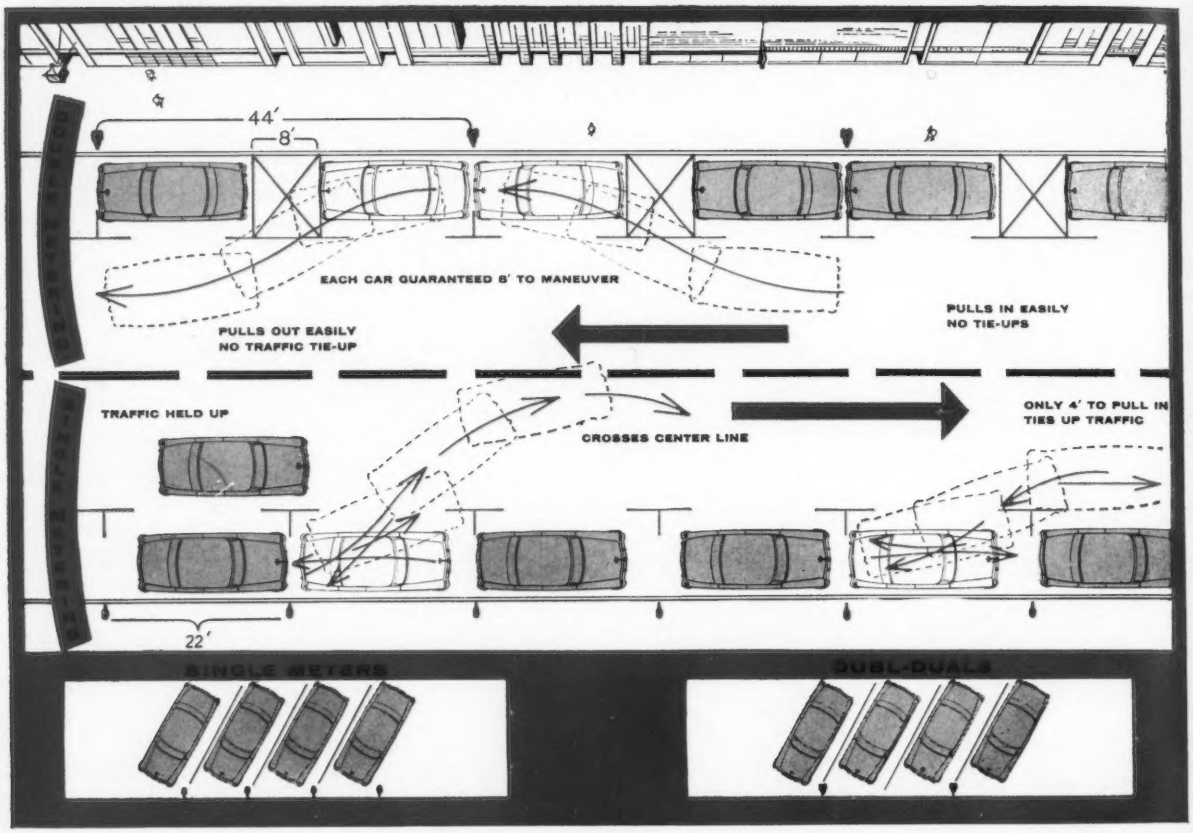
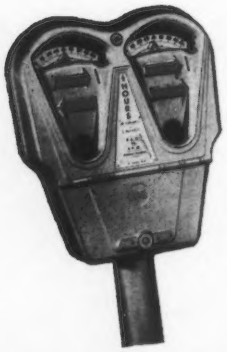
HOW TO MAKE THE MOST OF EXISTING PARKING SPACE



Only Dubl-Duals get the most out of existing parking space and reduce metering costs 27% in the bargain



The drawing above shows clearly how Dubl-Dual Parking Meters insure eight full feet between cars while single meters often reduce space to only four feet. Note too how traffic flows more easily and safely when cars are assured adequate room to maneuver into and out of the parking spaces.

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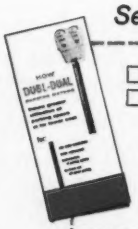

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Frankly Speaking . . .

DURING THE PAST DECADE, great advances have been made in the development of the automobile. We have seen the perfection of the automatic transmission, the growing popularity and convenience of power brakes and power steering. Much research has been carried on in the field of safety which has resulted in a more extensive use of safety glass, the introduction of seat belts, padded dash boards, safety door locks, control of headlight glare, and other devices aimed at reducing the number and severity of accidents.

The success of past research programs has not caused the automotive industry to lessen its interest in research; in fact, past success has only served to intensify research activity and we find automotive engineers co-operating with leaders in the electronics industry in an attempt to apply some type of electronic control over the operation of motor vehicles. Recent demonstrations of warning systems to detect the presence or proximity of other vehicles in unfavorable highway or climatic conditions and an electronic method of steering vehicles give promise of greater advances in the future.

While highway and traffic engineers have conducted research which has resulted in better, longer lasting, and more economical highways there is still much to be done. Currently, we are planning a 41,000-mile network of controlled access highways on which we intend to spend thirty-eight billion dollars. Despite the fact that we know through past experience and research that we can construct pavements which will withstand adverse weather conditions and will support the heaviest loads imposed upon them, we have not yet developed a control system which will insure continuous and safe operation of these facilities under all conditions. Moreover, these new highways are not adapted to automatic control of vehicles which will probably become a reality in the near future.

Most of our research efforts have been devoted to the construction of test roads to determine the best materials for pavement construction, the proper thickness of sub-base and surfacing, and other physical characteristics of the roadway. In view of the problems which lie ahead, it would seem that the research emphasis in the future should be to develop traffic control devices which would permit the greatest degree of operational efficiency and safety.

It would appear that now is the appropriate time for highway and traffic agencies to join together with leaders in the automotive, electronics, and allied industries in a comprehensive research program aimed at the development of a controlling system for this new and vast network of controlled access highways. Other agencies are discussing these possibilities, and as a profession we more than any other are primarily concerned with the ease and safety of traffic movement. In view of this, it would seem proper that the Institute of Traffic Engineers assume leadership in promoting the establishment of a test road for traffic control. We should look upon this opportunity as a challenge and meet it squarely.

ALGER F. MALO
Secretary-Treasurer
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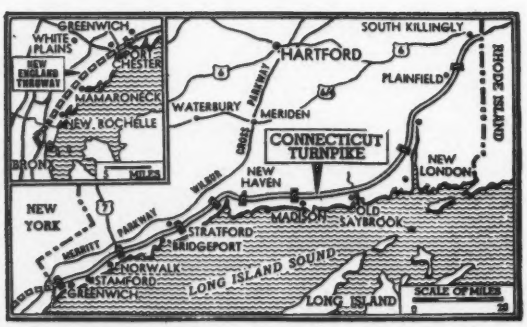
On the Connecticut Turnpike

STIMSONITE SIGNS THE WAY



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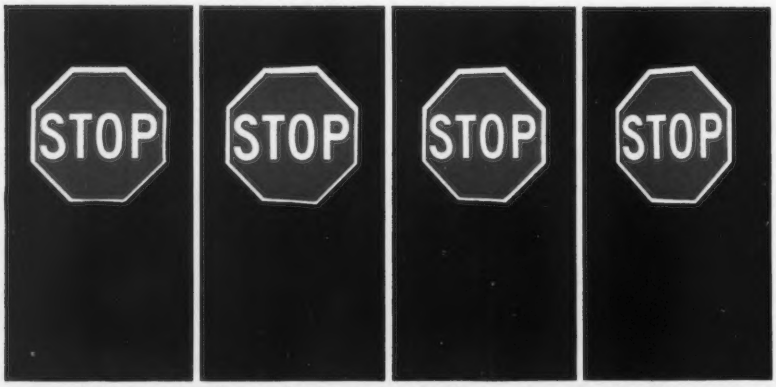
What characteristics should an effective traffic sign possess?

Broadly speaking, the answer to this question lies in investigation of 4 vital factors. As you may guess, the first of these is performance, far and away the most obvious sign feature to motorists. And, after this come the equally important economic considerations of sign fabrication cost, installation and maintenance ease, and durability, or useful length of life. Let's look at each more closely.

Performance

A motorist on the road after dark needs the help of traffic signs even *more* than a daylight driver. Accident statistics bear this out. With growing traffic volume—20,000,000 vehicles on the road after dark—the need for modern 24-hours-a-day signing cannot be denied. Whether the sign is a 24″ x 24″ curve warning or an 8′ x 10′ guide panel, *reflectivity* is a characteristic an effective sign must possess.



A sign of "Scotchlite" Reflective Sheeting performs without serious loss of brilliance through typical entrance angles of 0, 10, 20 and 30 degrees. Wide angle optical characteristics help compensate for road curvatures, installation inaccuracies and accidental or deliberate damage.

Brilliance of "Scotchlite" Reflective Sheeting doesn't "black out," even in rainy weather. All-weather visibility of shape, color and legend means full-time traffic sign effectiveness.

Moreover, since the need for communication is greater after dark, the need to show all three elements of a traffic sign—shape, color and legend—is also greater. A sign that only shows one of these elements after the sun goes down is only doing 1/3 of its job. A modern sign should show all 3 to work for full-time safety at 100% effectiveness.

Effective communication in all weather is another desirable modern traffic sign performance characteristic. Federal Government specifications (military specification R 13689A) call for sign material that maintains *at least* 75% of dry reflection when subject to rainfall testing. The higher the percentage, the better the sign . . . for again, motorists need the help of traffic signs most when driving conditions are the worst.

The final performance factor is angularity. Typical tests of sign materials at viewing angles of 0°, 10°, 20° and 30° quickly show that a truly effective sign material will retain high reflective quality through any angle of approach. It allows you to put each sign where it ought to be. Wide angularity gives you a measure of compensation for installation inaccuracies and for road curvatures. Also, if a sign is accidentally or deliberately twisted or bent, it will still communicate because wide angle reflectivity keeps the sign message from disappearing.

Durability

This is the first of the economic considerations. You naturally want signs that withstand weathering well enough to fit into your normal sign maintenance cycle. And you want reflectivity to remain high throughout the sign life so that effective communication with the motorist is not interrupted by decreased brightness.

Economy

For economy in effective signing, you want the lowest overall dollar cost consistent with desired performance and durability characteristics. The material that gives you this figure—(formed by dividing length of useful life into the cost of fabrication, installation and maintenance)—will minimize the true cost of communicating with the motorist.

Fabrication

Sign fabrication should be fast, clean and foolproof to insure uniform signing at lowest cost. Highest optical performance depends on a quality controlled sign material not subject to variations in technique or conditions such as humidity and temperature.

The material you choose will also provide more flexibility if it lends itself to both machine and hand application to any kind of backing. For further simplification, it should give you quick, easy refurbishing of old signs, flat or embossed, as well.

These four primary factors and their parts, according to leading engineers, make up the characteristics an effective traffic sign should possess. How do you get all of them at once? We believe there is only one sign material which provides them all: "Scotchlite" Reflective Sheeting. This is the precision all-weather sign material that can give the performance motorists need, with the durability and ease of fabrication and maintenance that you demand.

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MINNESOTA MINING AND MANUFACTURING COMPANY—Where RESEARCH is the key to tomorrow

A Performance Index for Parking Facilities

By Eric A. Mohr
(Assoc. Mem., ITE)
Assistant Transportation Engineer
California Public Utilities Commission
San Francisco

I *The Need for a Measure of Parking Performance*

MOST AMERICAN CITIES are faced with a parking problem. Demand for parking space far exceeds the available supply in the central business districts and elsewhere. Valuable street space on main arterials is occupied by curb parking lanes, except in those instances where the needs of moving traffic have been so pressing that they have forced a parking ban. Valuable off-street space in central business districts, neighborhood shopping centers and other locations of high parking demand is devoted to parking lots and garages. Answers to the parking problem are vital to the survival of the central business districts of our cities. The answers attempted during recent years, particularly those providing off-street parking facilities, not only require large funds but also are altering drastically the appearance and the character of many downtown areas. Parking problems and their answers are large in scope and profound in effect.

The basic problem of parking—excess of demand over supply—is the same in all cities affected. Likewise, the answer is the same in most cities — to increase supply. Creation of additional parking space provides only a partial solution, since the supply cannot be increased sufficiently to meet the ever increasing demand. Consequently, some metropolitan areas are attempting to stop, or even reverse, the increase in demand by encouraging the use of mass transit. Motorists that shift to mass transit leave their cars and their parking needs at home. Up to the present time, however, most of the effort and most of the achievements have been related to the increase in parking space supply and not to the decrease in parking space demand.

Although the basic elements of the problem are common to many cities, the specific aspects vary widely between cities, and between districts within the same city. Heavy parking demand may be found, for example, in a business district, in an industrial area, in an apartment house neighborhood, and in the vicinity of a large hospital. The characteristics of the demand, such as its duration and the hour or hours of peak demand, will be different in each area. Considerable variety exists also in the facilities provided to meet the demand: Curb parking may be parallel or diagonal, limited or unlimited, and limited parking may involve parking meter payments or be unmetered. Off-street parking facilities may be single or multi-level, may differ in hours of operation and in rate structure, may involve self-parking or attendant parking, to mention just a few of the characteristics of parking space supply.

Many parking facilities created in recent years have been designed with the assistance of traffic engineers. The 'traffic-engineered' facility represents more than a random try to increase parking space somewhere in a general area of high parking demand. It is the result of a purposeful effort to locate, design, and operate a facility in such a manner that it will fit the particular characteristics of parking demand in the area it is to serve.

Naturally, the traffic engineer wishes to know how successful he has been in this effort. A measure of the performance of the parking facility is needed. It is needed not only to satisfy the technical curiosity of the traffic engineer but to serve as a guide in the effort to solve the urgent urban parking problem. The following pages present the writer's attempt to develop a new measure to meet that need.

II *Performance Index for Short-Time Parking Facilities*

A. *Terminology*

Three terms are explained here to clarify their meaning in this paper:
Supply —Available parking space
Usage —Use made of parking space
Demand—Need for parking space

Supply and usage can be measured by observation. Demand, which is distinctly different from usage, can only be measured by ascertaining driver destinations through personal interview or postcard survey. Usage is not an accurate indication of demand.

B. *Derivation*

Most traffic engineers are familiar with parking performance studies. Parking in a given facility is observed, usually by periodic checks of license plates, to determine extent and characteristics of usage so that the traffic engineer may know how how well the curb space, lot or multi-level structure is performing its function of meeting parking space demand.[1]

A number of constant and variable factors enter into the study. The following factors, though different for each study, are fixed once the location and time for a given study have been selected:

Number of parking spaces available in the study area = S spaces
Duration of the study = T hours

1 For a more detailed description, see Study No. 22, "Manual of Traffic Engineering Studies" (Association of Casualty & Surety Companies, New York 1953).

The independent variables in a parking performance study are:

Space Number of parking spaces used by each vehicle [2]

$= s_1, s_2, s_3 \ \ldots s_n$ spaces

Time Parked by each vehicle

$= t_1, t_2, t_3 \ \ldots t_n$ hours

Number of vehicles observed in parking spaces during study

$=$ n vehicles

Some of the results of the study can be expressed conveniently in terms of 'space hours':

Space hours available

$= S$ (spaces) $\times$ T (hours)

Space hours used

$$= s_1 \text{ (spaces)} \times t_1 \text{ (hours)} + s_2t_2 + s_3t_3 + \ldots s_nt_n = \sum_{n}^{1} s\,t$$

The following ratios are often used to describe parking performances:

Turnover

Parked vehicles per available space hour

$$= \frac{n}{ST}$$ [3]

Space Usage (or occupancy)

Space hours used as percent of space hours available

$$= \frac{\sum_{n}^{1} s\,t}{ST} \times 100$$

Average Parking Duration

Space hours used per parked vehicle

$$= \frac{\sum_{n}^{1} s\,t}{n}$$

None of these ratios expresses parking performance adequately if used alone. It is desirable, therefore, to find some function of the constants and variables in the study that will serve as a single measure of the performance and need not be used in combination with other functions. All of the five constants and variables enter into the measure of performance. The desired function must therefore be of the form:

Performance Index $= P$

$= f\ (S, s, T, t, n)$

In a facility serving short-time parkers generally staying less than three hours for shopping or business purposes, both high turnover and high occupancy are desired. After analysis of various functions of the five factors, and of all possible combinations of the three ratios listed above, it appears that the following is the most satisfactory measure of performance for this type of facility:

Short-Time Performance Index $= P_s$

$$= \frac{n}{ST} \times \left[\frac{\sum_{n}^{1} s\,t}{ST} \times 100 \right]^a$$

$=$ turnover $\times$ space usage to the power 'a', is an arbitrary constant expressing the weight of occupancy relative to turnover in the determination of performance.

For initial testing of the Performance Index, 'a' was assigned the value of 1. Therefore,

$$P_s = \frac{n}{ST} \times \frac{\sum_{n}^{1} s\,t}{ST} \times 100$$

$$\frac{\text{vehicles}}{\text{space hours}} \times \frac{\text{space hours}}{\text{space hours}}$$

$$= \frac{100n \sum_{n}^{1} st}{(ST)^2} \quad \frac{\text{vehicles}}{\text{space hours}}$$ [4]

C. *Comparison with Turnover and Space Usage*

It has been stated above that neither Turnover nor Space Usage alone adequately reflects parking performance. Table 1 illustrates this point. The table compares results of parking performance studies for facilities A, B, and C. For the purpose of this example, equal spaces available and equal study durations have been assumed for the three facilities. The same number of vehicles used A and B, resulting in equal turnover ratios. The space usage at B, however, was only half that at A, and the turnover fails to reflect that fact.

The same amount of space hours was used at A and C, and their space usage figures are identical. C, however, was used by 50 per cent more vehicles than A, a fact not revealed by the space usage data.

The Performance Index is sensitive to both turnover and space usage, as shown in Table 2, developed from the same data as Table 1.

Another limitation of the turnover ratio is its dependence upon the license plate check interval. A study of a short-time parking facility based on checks every ten minutes will produce results considerably different from another study based on twenty-minute checks, and both studies will vary considerably from the actual turnover, as illustrated by Table 3.

This table shows how many cars, percentagewise, are not observed at all during a parking study based on periodic license checks because they were parked and unparked between two consecutive checks.

While not necessarily typical of short-time parking facilities, the table gives an indication of the effect of varying the observation interval. The Performance Index is a function of turnover, and is therefore subject to the same limitation.

D. *Range of Values*

Development of the Performance Index for selected short-time parking facilities is shown on Table 4.[6] Only curb parking spaces are included. The Performance Index for the five selected locations varies from a low of 12.1 to

---

2 For practical purposes, $s_1 = s_2 = s_3 \ldots s_n = 1$. This variable is ordinarily not recorded in the study and is included here only for dimensional consistency in the derivation.

3 Some reports of parking studies express turnover merely as the ratio of parked vehicles to available spaces, or

$$\text{turnover} = \frac{n}{S} \quad \frac{\text{vehicles}}{\text{spaces}}$$

Unless turnover is expressed in vehicles per space hour, it is a function of the duration of the study, thus limiting the use of turnover figures to the particular study or others of identical length.

4 Units are included here to show that P_s is not a dimensionless quantity. The units have no further significance and are dropped for the rest of this paper.

TABLE 1

	(1) Spaces Available	(2) Duration of Study	(3) Space Avail.	(4) Hrs. Used	(5) Space Usage	(6) Vehicles Parked	(7) Turnover
Symbol	S	T	S × T	Σ s t	$\frac{\Sigma s t}{S T} \times 100$	n	$\frac{n}{S T}$
Units	spaces	hours	space hours		%	vehicles	vehicles / space hour
Parking Facility A	20	10	200	160	80	240	1.2
Parking Facility B	20	10	200	80	40	240	1.2
Parking Facility C	20	10	200	160	80	360	1.8

TABLE 2

	(1) Turnover	(2) Space Usage	(3) Performance Index
Parking Facility A	1.2	80	96
Parking Facility B	1.2	40	48
Parking Facility C	1.8	80	144

TABLE 3 [5]

License Check Interval	Parked Vehicles Missed as % of Total Parked Vehicles	
	Study #2	Study #3
Continuous Observation	0 %	0 %
10 minutes	21.8	19.8
15 minutes	29.5	30.0
20 minutes	35.6	39.4
30 minutes	41.8	46.9

a high of 130. These values give an idea of the range of the Index. The range may tentatively be divided as follows:

Performance	Ps
'Good'	Above 80
'Fair'	50 – 80
'Poor'	Below 50

The highest value in Table 4 is based on a turnover of 1.56 vehicles per space hour and 83.5% space usage in a neighborhood shopping district in Berkeley, California. The lowest value results from a turnover of 0.32 vehicles per space hour with 37.8% space usage, observed in a neighborhood shopping district in Cicero and Berwyn, Illinois. Most of the 'good' per-

5 The data are based on the second and third of a series of studies conducted by the writer several years ago in Berkeley, California. Two block sides were held under continuous observation for ten hours, and every parking and unparking move was recorded. These data are also reported on page C-4, Traffic Engineer's Technical Notebook.

6 All studies listed were conducted by the writer while on the staffs of the Institute of Transportation and Traffic Engineering of the University of California in Berkeley, and of De Leuw, Cather & Co. in Chicago.

TABLE 4

DEVELOPMENT OF PERFORMANCE INDEX
FOR SELECTED SHORT TIME PARKING FACILITIES

No.	Location	(1) Parking Restrictions	(2) Parking Meters	(3) Time of Study*	(4) Check Interval	(5) Space Available	(6) Duration of study in Hours	(7) Spaces Hours Avail.	(8) Space Hours Used	(9) Space Usage in Pct.	(10) Vehicles Parked	(11) Turnover	(12) Performance Index, Ps
	Reference:	—	—	—	—	—	(3)	(5)×(6)	—	$\frac{(8)}{(7)}$ ×100	—	(10)÷(7)	(9)x(11)
1	Euclid Avenue Berkeley, Calif.	0900-1800 1 hour	unmetered	0900-1800	continuous	25	9	156.3**	130.4	83.4	244	1.56	130
2	Euclid Avenue Berkeley, Calif	0900-1800 1 hour	metered 5¢ /hr.	0900-1800	continuous	25	9	225	122.0	54.2	414	1.84	100
3	No. Michigan Ave. Chicago, Ill.	0700-0930 no parking 0930-1600 1 hour 1600-1800 no parking	unmetered	1000-1600	30 min.	125	6	750	605.5	80.7	591	0.79	63.8
4	Cermak Road Cicero & Berwyn, Ill.	No posted limits	metered 5¢ /hr.	1000-1800-	30 min.	230	8	1,840	962.0	52.3	1,166	0.63	32.9
5	Side streets of Cermak Road, Cicero & Berwyn, Ill.	No posted limits	metered 5¢ /hr.	1000-1800-	30 min.	128	8	1,024	386.5	37.7	331	0.32	12.1

* All studies were actually conducted for more hours than shown here, but the data in this table cover only the period listed in col. (3).
** 68.7 space hours not available due to construction work.

PERFORMANCE INDEX FOR SHORT TIME PARKING FACILITIES
AS A FUNCTION OF TURNOVER AT VARIOUS SPACE USAGE LEVELS
(a=1)

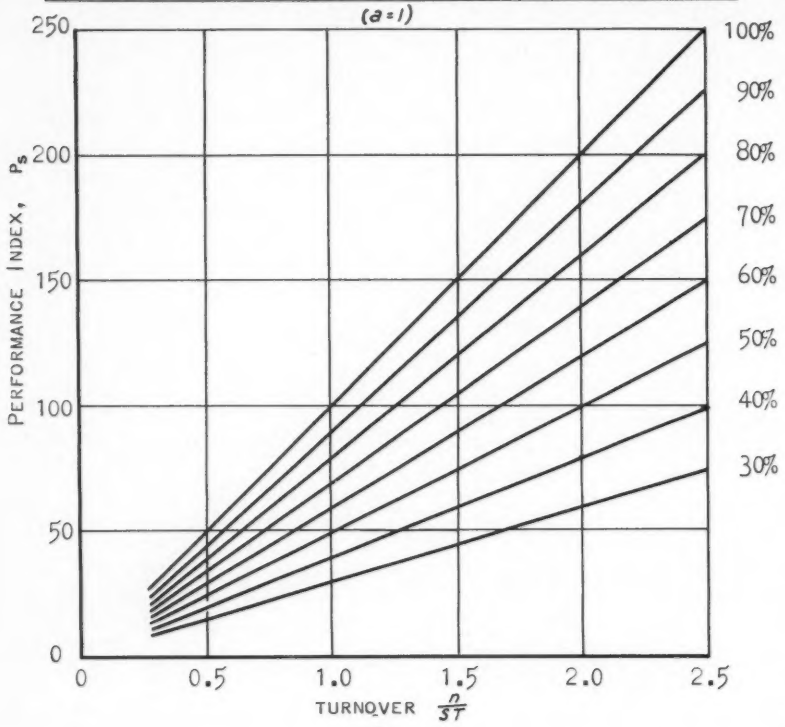


FIG. 1

SPACE USAGE AS A FUNCTION OF TURNOVER
FOR VARIOUS VALUES OF PERFORMANCE INDEX
(a=1)

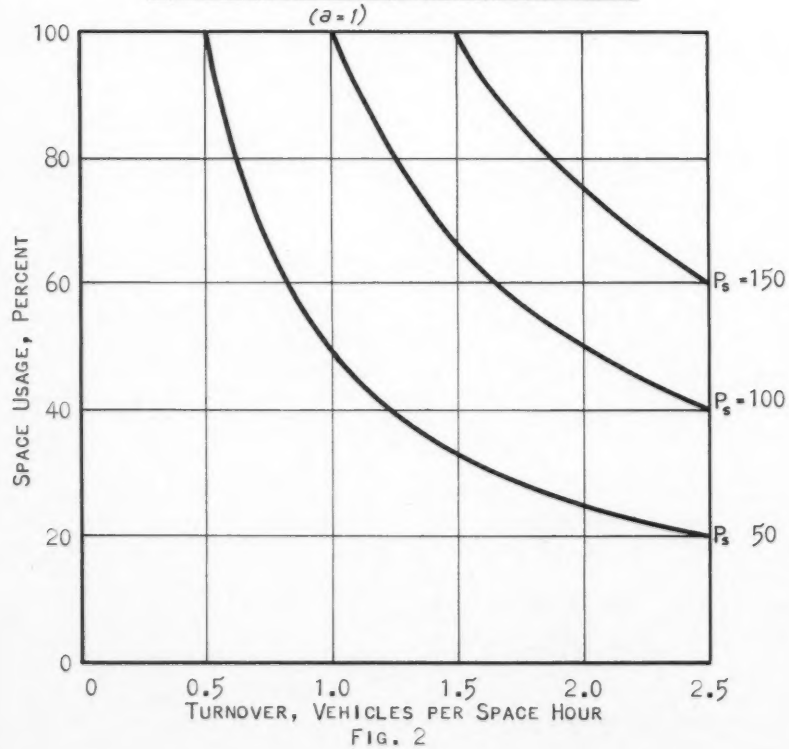


FIG. 2

formances observed, incuding studies not shown here, were based on a turnover of about one vehicle per space hour and space usage in the neighborhood of 85%.

The accompanying graph further shows the range of variation of the Index. For purposes of illustration, values for turnover and space usage beyond those normally observed in parking studies are included on the graph.

Figure 2 illustrates the combinations of turnover and space usage that will produce various values of the Performance Index. At a = 1. turnover of 2.0 and space usage of 75% will result in an Index of 150; a 2.5 turnover with 60% occupancy yields the same value of 150.

E. *Applications*

A variety of potential uses exists for the Performance Index. It combines all essential characteristics of parking performance in one number, and thus makes valid comparisons of various studies of short-time parking facilities possible. It is based on space hours, and is therefore independent of the variations in survey duration. Results of parking studies conducted under a wide range of conditions can be compared.

Specifically, the Index may be helpful in before-and-after studies when parking control measures are instituted or changed, for example:

Placing time limit on curb parking
Changing time limit on curb parking
Installing parking meters
Changing parking meter rates
Changing enforcement level of parking regulations

The first two lines on Table 4 illustrate such an application. After meter installation, the turnover increased, but the space usage decreased, and the traffic engineer needs an answer to the question: Did the short-time parker benefit from meter installation?

The Index may be a useful tool in comparing different rate structures for off-street parking facilities. In several major cities, controversy exists over the rates charged by commercial lot operators. Parking authorities or others claim that certain off-street facilities use rates favoring the all-day parker, and the operators disagree. The Per-

(Continued on page 38)

No Passing Zone Procedures

By W. J. Bartels
(Jun. Mem., ITE)
Principal Traffic Engineer
New Jersey Bureau of Traffic Safety
Trenton

THE State Bureau of Traffic Safety has the responsibility for all traffic regulations on all county and municipal roads throughout the State of New Jersey. One of these responsibilities is the design of No Passing Zones.

The method of determining proper No Passing Zones varies considerably. Plans and profiles are used extensively with the aid of templates, mathematics or a combination of the two. However, this method should be modified in the field as a result of obstructions such as trees or buildings. Caution must be exercised in the use of templates, for under certain conditions they could lead to faulty design. Some No Passing Zones have been "eyed in." Two men or two vehicles have been connected with a length of rope equal to the design sight distance. When one is out of sight from the other, a No Passing Zone is established for this length. This last method is known as the "Target Method." Various methods have been used by this office. However, with the tremendous amount of traffic that exists in the State of New Jersey, we consider the tying of two vehicles or two persons together to be entirely too dangerous and, therefore, this method as described has never been used.

The "Target Method" would be a very satisfactory method if it were possible to eliminate the use of the rope. A means has to be found to keep two vehicles the same distance apart without physical connection. If two vehicles are each equipped with an accurate measuring device and connected, not by a length of rope, but by two-way radios, the "Target Method" is safe, fast and reliable.

In "A Policy on Criteria for Marking and Signing No Passing Zones on Two- and Three-Lane Roads" by the American Association of State Highway Officials, February 17, 1940, it has been agreed that when the sight distance ahead is less than 500′, 600′, 800′ and 1,000′ for design speeds of 30, 40, 50 and 60 MPH respectively, then a No Passing Zone should be established. The line of sight is considered to be 4.5′ above the pavement surface at both initial and end points. For the purposes of our studies, when the first car is out of the sight of the operator of the second car, it is considered that the sight distance is less than the design sight distance.

The above standards of design sight distance are being used in New Jersey. In establishing No Passing Zones, however, we must be aware of three undesirable situations which may arise. First, the distance where the sight distance is restricted should be of some significant length before a No Passing Zone is considered. Second, the actual marking should be of sufficient length to be practical. Third, short sections between No Passing Zones where passing is permitted should be avoided.

In order to be realistic, the above minimums should vary with the design speed. The various design standards have been calculated for design speeds ranging from 25 MPH to 60 MPH in increments of 5 MPH. All figures have been rounded off to the nearest 10′ and are tabulated in Figure 1 "NO PASSING ZONES — DESIGN STANDARDS."

Target Method

Two drivers and one engineer are the minimum required personnel. Two vehicles are used, each equipped with a foot survey meter, two-way radio and tagged with an appropriate sign. A suitable voice recording machine is installed in the second or "lag" vehicle for the use of the engineer.

A foot survey meter in each vehicle must be adjusted and calibrated. This is done by varying the pressure in the rear tires. The error between the two vehicles should not be greater than 0.2% and the error of the less accurate foot survey meter should not be in error by more than 2% as compared with the true distance.

The base line is a listing of reference points. This base line is used to control the field investigation, the necessary calculations and to later locate the No Passing Zones. The vehicle with the more accurate foot survey meter, a voice recorder and a sketch or map of the road is used in determination of the base lines. This vehicle with the driver and the engineer will start at the beginning of the road or at a point which can be easily located in the office and field. With the foot survey meter at zero, the base line run will proceed in either an easterly or a northerly direction. All prominent locations such as cross roads, waterways, railroad overpasses and corporate lines are located. These various locations are voice recorded by their names, the foot survey meter readings and any information that will later help identify them. In order to keep the errors small, it is most desirable that the base line does not exceed 5,000 feet.

In order to determine the restrictions in sight distance, it is necessary to keep the two vehicles the same distance apart. The driver of the first or lead vehicle, with his foot survey meter at zero, will proceed from the initial point of each base line in an easterly or northerly direction a distance equal to the design sight distance. The driver of the lead vehicle will then set his foot survey meter at zero. With the "lag" vehicle at the initial point of each base line, the lead vehicle located a distance ahead equal to the design sight distance and both foot survey meters set at zero, the engineer, located in the lag vehicle, will instruct both drivers to start moving.

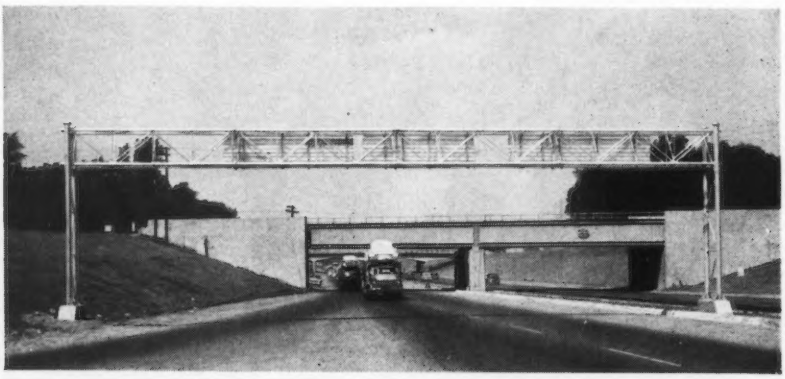
NO PASSING ZONES — DESIGN STANDARDS

Design Speed MPH	Design Sight Distance FT.	Minimum No Passing Zone FT.	Minimum Marking of Zones FT.	Minimum Distance Between Zones FT.
25	450	70	250	360
30	500	90	300	400
35	550	100	350	440
40	600	120	400	480
45	700	130	450	560
50	800	150	500	640
55	900	160	550	720
60	1000	180	600	800

Figure 1

NOTE: This table can readily be placed on 3″ × 5″ filing cards.

During this phase, a speed of 15 to 20 MPH was found to be most desirable, but will vary according to conditions. The engineer will observe the foot survey meter and communicate by radio to the driver of the lead vehicle the reading every 100′. The driver of the lead vehicle will become accustomed to the pace by listening to the foot survey meter readings of the lag vehicle and having his own foot survey meter correspond.



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The driver of the lag vehicle will observe the lead vehicle at all times. At which point it disappears from his sight he will inform the engineer, who will record the foot survey meter reading of this location. During this time, the engineer will be unable to communicate the foot survey meter readings to the driver of the lead vehicle. However, this will be only for short distances and the driver, will by this time, be accustomed to the pace. When the lead vehicle appears in sight to the driver of the lag vehicle, he will indicate it to the engineer, who will record the foot survey meter reading of this location.

This is continued for the entire length of the base line with check points located approximately 2,000′ apart. These check points are taken from the base line. The foot survey meter readings of the lag vehicle should be equal to the base line readings. If the error is greater than 25′, the run is done over. The difference between the two foot survey meters at the check point should be equal to the design sight distance. If the error is greater than 25′, then the run is done over. If the errors are less than 25′, then the foot survey meters are adjusted to the base line reading at this time.

No writing is done when the vehicles are moving and all work is voice recorded.

It is only necessary to check the sight distance restrictions in one direction. The rest of the No Passing Zone investigation is done in this office. The engineer listens to his own recording and fills out all necessary information resulting from the field work.

In order to get a picture of the entire investigation and to serve as a check on possible errors, cross section paper 10 × 10 to the half-inch is used to lay out the entire field and office work.

A few variations from the above standards are considered to be desirable and they are:

1. If the No Passing Zone ends just before an intersection, it is extended to 50′ beyond the intersection.

2. A No Passing Zone is recommended on the approach to a STOP sign and is calculated by multiplying the 85 percentile speed at this location by 10 and is the distance in feet.

Various forms have been devised for these investigations and a more complete explanation of the procedure is available. They may be obtained upon request from the author.

Systems Analysis in Transportation Planning and Traffic Engineering

By Howard S. Lapin
(Assoc. Mem., ITE)
Research Associate, University of Pennsylvania
Institute for Urban Studies, Philadelphia

SINCE WORLD WAR II, ways of thinking about the performance of integral, purpose-accomplishing systems have evolved virtually to the point of creating a new technical discipline.[1,2] The ways of thinking are not new in the sense that they consider the contribution of all elements of a system toward the accomplishment of a specific purpose; such considerations, in varying degrees of refinement, have always been a part of planned endeavor. But some of the methods developed in recent studies of dynamic systems and their functioning components are genuinely new. These methods and their disciplined rationale have sometimes been termed "systems analysis".[3] This article seeks to suggest opportunities for extending the use of systems analysis to some of the activities which fall within the scope of transportation planning and traffic engineering.[4]

The System Concept

A system is defined as a group of interdependent elements acting together to accomplish a purpose common to all elements. A system analysis is an attempt to define the most feasible and desirable way or ways to accomplish an intended purpose.[5]

Accurate definition of the system, in detail and extent, and clear delineation of purpose are the factors upon which depends the success of a system analysis. These first two steps are crucial.

Finding the best way to accomplish the intended purpose involves the selection of an optimum (most economical and expeditious) combination of the characteristics of the elements with all elements in normal operation.*

The operations of the elements, it should be noted, are not so much "broken down" as they are built up into a new structure; hence a synthesis of the organized elements into a dynamic model for study is a method frequently employed.

Transportation System Planning and Design

The systems analysis concept applied to urban transportation planning and design demands consideration of the total plant for circulation within the urban area. The streets and highways, local transit and parking facilities thus receive simultaneous consideration as elements of a system. From this, two major factors emerge which dictate a classification of the facilities: (a) the pattern of usage, and (b) land use and economic factors of the areas served. Taking only streets and highways for the moment, classification consists of grouping routes into categories of similar pattern and service, such as major highways and expressways; feeder and distributor streets and highways; and local service streets. Classification of routes is of aid in developing design standards, in route planning, and in allocation of capital and maintenance funds.

Land use and economic factors are evaluated in terms of the contributions of the various residential and income-producing districts of the city to the total traffic volume. (In the first approximation of generation ratios, land use may be considered an independent variable.)

Traffic-generating characteristics of various kinds of residential, commercial and industrial land uses can be used, in conjunction with census and other population-distribution studies, to predict future traffic volumes, and thus to plan for street and arterial improvements. Knowledge of traffic-generating characteristics of the several kinds of land use is also an aid to city planning so that consideration can be given to closer location or origin and destination areas with heavy-traffic-volume linkages. The major spelling out of this type of study and its preliminary investigation was presented in 1954 by Mitchell and Rapkin.[6] To date, the most fully documented case study in land use-traffic analysis has been completed for the Detroit Metropolitan Area.[7] Other studies of this nature are going forward in Chicago, Philadelphia, St. Louis, San Diego and Washington, D.C. That some of the urban travel studies require repetitive analysis of voluminous trip data is becoming less a deterrent as coding routines for electronic computers are developed for dealing with such problems, and as more transportation agencies avail themselves of this type of service.

The daily network of person-trips, in systems analysis, is a motion-struc-

1 G. S. Brown, "Feedback System Engineering: Expanding Professional Field." **Electrical Engineering Magazine**. December 1952. pp. 1067-1071.

2 C. W. Worley and G. W. McKnight, "Advancing Process Control," **Instrumentation**, Vol. 7, No. 1, 1953. pp. 21-28.

3 Norman N. Barish, **Systems Analysis for Effective Administration**, New York: Funk and Wagnalls. 1951.

4 University of California, Institute of Transportation and Traffic Engineering, Berkeley. **Systems Analysis in Transportation Engineering**. Technical Memorandum 28, H. S. Lapin, Sept. 24, 1954. The present article is derived in part from ideas of this I.T.T.E. memorandum.

5 John McDonald, "The War of Wits." **Fortune Magazine**, March 1951. pp. 99-102, 147 . . . 158.

*The best individual characteristics of the components need not correspond to their desirable characteristics when in combination as a functioning mechanical system. For example: cruise speed for least fuel consumption may not correspond to the speed required by a commercial vehicle operator in order to minimize his labor and vehicle-use costs. Considering the flow of vehicles over a number of city streets as a functioning system, neither of the two speeds discussed above may correspond to the speed for flow of the maximum number of vehicles in densely traveled sectors.

6 Robert B. Mitchell and Chester Rapkin, **Urban Traffic, a Function of Land Use**. New York, Columbia Univ. Press. 1954.

7 Detroit Metropolitan Area Traffic Study. **Data Summary and Interpretation**. Part I. 1955. See Chapter V.

ture to be cross-sectioned as finely as possible, but with the concept of the whole remaining intact.

To obtain an index of peak-period demands for major through routes, the total entity of work-purpose trips by auto drivers can be studied for area patterns. Area patterns can be drawn from tabulations of trips from residence origins to work-place destinations. For this problem, one tabulation by all modes and a second by industry-of-occupation of worker are desirable to provide information for understanding and prediction of trip patterns of persons enroute to and from work.[8] Similar consideration should be given to transit trips. Area factors most useful in explaining transit trip-generation patterns are income levels and net residential population density.

Analysis of parking demand by area is aided by study of work-trip accumulations, using auto work-trips tabulated by time of arrival at the destinations. Calculation of parking space demands per employee in various parts of the city may better be calculated as the ratios of persons per car (for work-destined trips) are obtained. The latter information may be found of value for city planners in establishing off-street parking requirements in zoning for industrial areas.

In operating a complex physical system, it is important to decision-makers: to obtain a concept of economic scale among the elements, to determine the limits within which they operate, and to see whether or not a proposed change will work. These relationship studies are aspects of a system analysis. To illustrate: One vital type of relationship study is that of changes in capacity requirements for arterial distributors as the mileage of urban expressways is increased. Another has to do with the capacities of a number of radial expressways, a central expressway distributor loop served by the radials, access ramps of the loop, and the instantaneous and cumulative absorptive capacities of streets and parking facilities within and adjacent to the loop. Both types of operational characteristics studies are "in the works" in Philadelphia at the present time.

Where changes are made in the transport network on the basis of the system analysis, it is important that "before and after" studies be made in order that the effect of change in characteristics of an element can be judged in relation to the performance of the system,[9] and to check validity of the method.

"Before and after" studies have been made and will continue to be made without such a term as "system analysis" being applied to them. The point remains that consideration of the integral nature of the transport system may lead to better understanding of *all* effects of observed changes. Another advantage: the over-all approach reduces the possibility of omitting important (and perhaps obvious) factors. The factor most difficult to include in planning and design studies, and one easy to forget, is that of the future behavior of the users of transportation as the facilities become less serviceable or are improved.

Realistic assessments of benefits of improvements are possible with simultaneous consideration of all the elements. Time-savings benefit analyses for individual expressway segments are of value for the first few links in a network of expressways. As the free-flowing network develops, however, it is clear that a limit of this type of benefit analysis is reached. Maximum calculated benefits would ultimately be reached with a very high ratio of expressway mileage to local streets, maximum distances between origins and destinations, and little or no use of transit facilities. On the other hand, a system benefit analysis would compare complete models with varying assumptions as to the expressway network, the use of automobiles, and use of transit. Annual capital and operating costs of the facilities for each alternative model would then be summed —and assessed against the costs to users of the system. Time savings or costs might then be included in consideration of effects for the users.

In general, the system concept enforces a discipline in problem-solving to the effect that new methods may be evolved to measure the contributions of the various elements in accomplishing the defined purpose(s). It is to be hoped that this concept may strengthen the techniques of transport technicians in the way that rigorous systematization for analysis of force systems greatly advanced the engineering studies of statics and kinematics.

Traffic Engineering and Control

It is in the performance of traffic engineering functions and use of traffic control devices that the methods of mechanical system analysis appear most applicable. The movement of vehicles within a city or on a highway network constitute flows which are subject to speed and volume-density regulation. Where there is sufficient justification in terms of dollar and safety benefits, the flow of traffic along a particular route can be made subject to progressively-timed signal control, with some small number of the inter-connected signals responsive to vehicle-actuated devices which measure volumes and delay or speed. In Denver, several years of experience have been obtained with control of signal cycle-length by vehicle-actuated counters. Other cities, Chicago and Philadelphia, for example, have also installed a number of automatic traffic control devices to control cycle length and off-set (that is, the time-lag or-advance between coordinated signals). Earlier devices of this type employed treadle actuators for the response to traffic conditions, but radar systems are being perfected for this service. The point to observe is that traffic flow is being considered as a physical process subject to regulation by automatic devices, and the devices are designed to feed control information back into the system to obtain the characteristics calculated to be conductive to optimum expedition of movement.

The possibilities for arranging local and through-route traffic control devices into systems of *area* traffic control (integrated traffic control over an extensive urban district) depend primarily on the transmission of traffic volume and density information back to a master control station.[10] Considered over an area, flow is to be expedited by the balanced distribution of traffic on the lesser-used streets as well as by progressive signal timing on the major through-rates. The means of collecting such information can range from human observers who report from within the traffic flow or at some vantage point above it, to automatic reporting de-

(Continued on page 38)

8 H. S. Lapin, "The Analysis of Work-trip Data," **Traffic Quarterly**, April 1957, pp. 278-292.

9 W. H. Glanville, "Operational Research, Its Application to Peace-time Industry," **Operational Research and Road Research**. A publication of the Manchester Joint Research Council. Great Britain. Nov. 25, 1949.

10 University of California, Institute of Transportation and Traffic Engineering, Los Angeles. **Area Traffic Control, Summary of Past Work**. Technical Memorandum L-5 (A and B), D. Gerlough. Aug. 2, 1954.

Highway Turbine Interchanges

By S. M. Breuning
(Jun. Mem., ITE)
Asst. Professor of Civil Engineering
University of Alberta, Edmonton

INTERCHANGES are defined in the "Highway Capacity Manual" as: "A system of interconnecting roadways in conjunction with a grade separation or grade separations providing for the interchange of traffic between two or more roadways or highways on different levels."

This definition is rather general; it does not refer in any way to possible interferences between different traffic streams. It obviously assumes that the grade separations eliminate at least the most serious interferences in an intersection at grade. The degree to which interferences of traffic streams are eliminated determines the efficiency of the interchange.

Interchanges of highways with limited access must be designed according to some fundamental rules. Exits and entrances from and through roadways must be provided at the outer, right-hand side of the roadway so as to keep the inner, left-hand lanes undisturbed by turning vehicles. Exits and entrances also must be designed in such a way that the turning vehicles, either leaving or entering the main roadway, may manouevre without unduly affecting the through traffic, and especially without accident hazard. In addition all streams of turning traffic, considered as the minor traffic streams, should interfere as little as possible with each other.

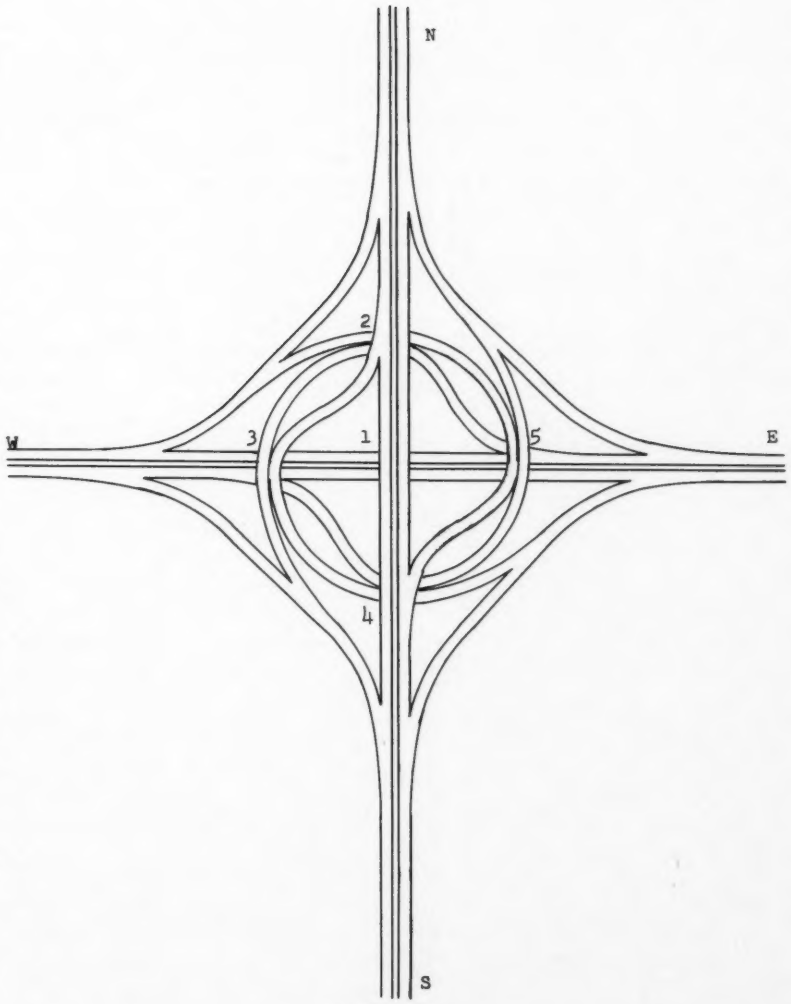

Figure 1
Turbine interchange.

Comparison with Cloverleaf and Rotary

The turbine interchange (Figure 1) can best be explained in comparison with the cloverleaf and the rotary interchanges.

The cloverleaf is the most commonly found interchange on highways. It is simple except for the left-turning movements, yet even these are by now well accepted by the motorists. Left-turns are accomplished by making a three-quarter right turn. This is sometimes a little confusing to the driver, who easily loses the sense of direction. It also requires rather sharp curves which can be negotiated only at speeds much lower than used on the open highway. This required reduction of speed definitely is one of the drawbacks of any interchange, especially the cloverleaf. Its correction would be possible only with prohibitively large layouts which are not economically justifiable. Another drawback of the arrangement of the left-turning movements in a clover-

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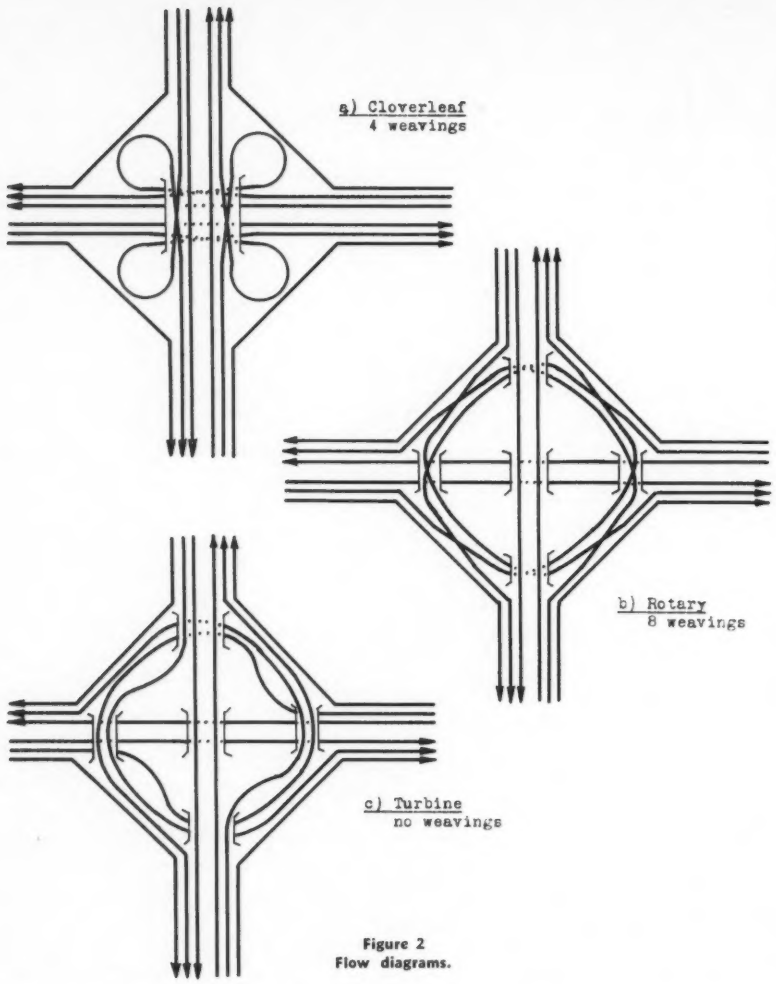

Figure 2
Flow diagrams.

leaf is the weaving of each left-turning path with two other left-turning paths. This problem, demonstrated in Figure 2A is of no importance, as long as the volumes of traffic of the turning movements are low. When the turning volume gets heavy, as it often does in suburban sections, vehicles negotiating conflicting left-turning movements will no longer be able to weave, and a bottleneck will result.

The rotary interchange is less often found on modern superhighways. It is developed from a surface rotary intersection by addition of one (or two) through highways with grade separations. The rotary roadway is a circular one-way roadway, driven in a counterclockwise direction. Traffic enters it and leaves it from the outer, right-hand side. All movements except right-turns therefore must weave with some other traffic streams. Thus the capacity of the rotary also is limited by the volume of the two largest weaving traffic streams. In Figure 2B a rotary is shown with two through highways. Only the turning vehicles enter the rotary, and the right-turning traffic streams do not have to weave. The left-turning movements, however, have to weave four other left-turning traffic streams. Thus the rotary is limited by the volume of the two largest conflicting left-turning volumes.

The curves necessary for a rotary are not quite as sharp as for a cloverleaf covering the same area, but five bridges are required instead of one for the cloverleaf.

The turbine interchange is similar to the rotary described above, except for the entrance of the left-turning movements into the rotary. Instead of coming from the outside of the circle, the left-turning traffic first crosses the rotary along with the main highways and then enters from the inner, left-hand side of the rotary roadway. By this simple change, left-turning movements no longer cross each other, although they may run parallel for some distance on the rotary.

The structural requirements for the turbine are essentially the same as for the rotary discussed above. The entrance lanes for left-turning movements are the only fundamental difference. These must be built with somewhat sharper radii in order to provide a smooth S-curve from the through roadway to the rotary. Therefore the speeds permissible for left-turning traffic are lower than in the rotary, but still as high or higher than in the cloverleaf, occupying the same area.

Principle

The layout of the turbine, as shown in Figure 1, consists of

the intersecting main roadways (SN, NS,WE,EW),

the right-turning roadways (SE,EN, NW,WS),

the left-turning roadways (SW,ES, NE,WN).

The main roadways and the right-turning roadways are essentially the same as in any conventional interchange.

The left-turning roadways have given this type of interchange its name, because as in a turbine, the left-turning traffic enters the rotary from the inside, gradually proceeding to the outer edge in the course of accomplishing the left-turn, and finally leaving in its new direction. Traffic making left-turn SW for instance enters upon a sharp S-curve right after it has crossed the rotary at point 4, Fig. 1. The roadway then proceeds to join the rotary which, in this case, is a circular roadway made up of pieces of left-turning roadway. SW follows the rotary from point 5, where it crosses over the main highway (EW) until point 2, where it crosses under the main highway (SN). After point 2 the roadway leaves the rotary and enters into the main highway (EW).

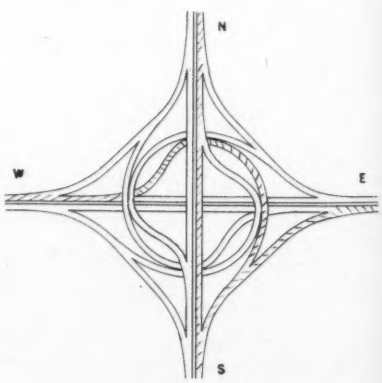

Figure 3
Turbine interchange (reversed).

Naturally, the left-turning roadways can also be led through the rotary entering from the outside and leaving from the inside (Figure 3), a complete reversal of the previous design. This would be advantageous for fast traffic because the sharpest curves occur towards the end of the turning roadway rather than towards the beginning.

In the foregoing designs the right-turning roadways determine the outer limit of the whole interchange. In cases of extreme scarcity of land it might be preferable to put the right-turning roadways within the circle (Figure 4).

The obvious disadvantage of this design is a crowding of exits and entrances of turning lanes from the open highways to the structures. Such arrangement requires generous layouts of the bridges in order to provide necessary manoeuvres of the vehicles.

Vertical Arrangement

There are three possibilities for the vertical layout of the roadways in a turbine interchange.

(1) Rotary *over* intersecting highways

(2) Rotary *under* intersecting highways

(3) Rotary *over* one and *under* the other intersecting highway.

Only the left-turning vehicles must change grade in the first two arrangements. The left-turning roadway has an ascending (or descending) slope in the first quadrant, then it stays at the elevated grade and descends (or ascends) in the last quadrant.

The disadvantages of this arrangement are the rather steep slopes or long ramps required, which tend to govern the size of the interchange as a whole. The advantage of appearance can be disputed. The use of the grades as aids for deceleration and acceleration is doubtful, because of the curvature and the restrictions at the entrance into the other roadways.

Leading the rotary roadways in turn over and under the main highways provides a more versatile solution (Figure 1). It may be assumed that the two intersecting highways are at different grade, thereby facilitating a grade separation. All turning vehicles stay at their initial elevation throughout the first quadrant, and change grade in the second, remaining at the new grade in the third.

This arrangement has grades in less critical locations, where vertical curves can be fitted easily and no driver distraction occurs. It also should provide greater versatility for adaption to existing topography.

Driver Acceptance

Highway interchanges are no longer instinctively understood by the driving public. Elaborate route and directional signs and familiarity on the part of most drivers are necessary to enable large volumes of vehicles to flow through an interchange without delay for orientation. Nevertheless, it is always desirable to maintain a logical layout of the roadways so that drivers do not get the feeling that they are on the wrong road. Making a three-quarter right-turn instead of a one-quarter left-turn still is rather confusing to many drivers.

The turbine intersection provides in its rotary roadway a common focus which should enable drivers to orient themselves more easily within the layout. The entrance on to the rotary from the inside may be a disadvantage because it is somewhat hidden immediately after the crossing of the rotary roadways.

The rotary roadway of the turbine offers the additional advantages of crossovers at the locations of the crossings with the through roadways. These crossovers provide for drivers who take the wrong turn and would like to continue straight through and, more important still, for traffic turning around.

Structures

For the turbine interchange as outlined here five structures are required: one crossing structure for the crossing of the main highways (Pt. 1 in Figure 1), the same basic structure that would be provided for a cloverleaf; and besides this, four smaller bridges to lead the rotary roadways over or under the main intersecting roadways.

Geographic Adaptability

The larger number of structures required for this interchange and the necessity to make these structures as simple as possible make it desirable to have fairly flat land at least within the area of the rotary roadway. The possibility of varying the relative elevation of the crossing roadways with the requirements of the topography make the design more flexible than it may seem at first.

(Continued on page 30)

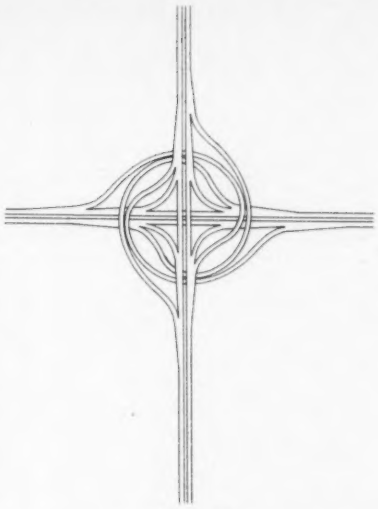

Figure 4
Turbine interchange with right turning roadways within the rotary.

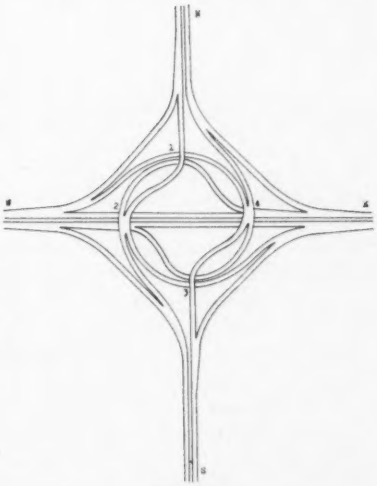

Figure 5.
Feeder road turbine interchange.

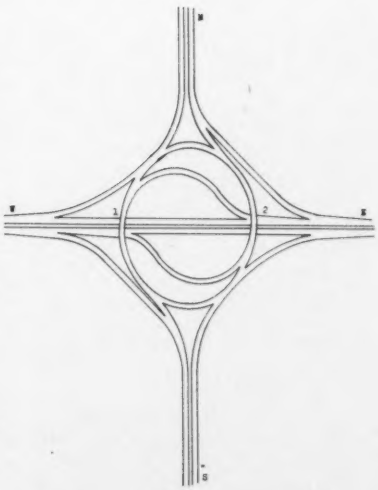

Figure 6
Simplied feeder road turbine interchange.

Traffic News

Citizen Leaders Attend Public Support Conferences

Community leaders from all parts of the country are attending four public support conferences being held by the President's Committee for Traffic Safety.

One conference was held in Atlantic City last month, conferences are being held in April in Chicago and San Francisco, and the Southeast Regional Conference will be held in Miami Beach May 29 and 30. This last conference will serve the states of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, West Virginia.

Delegates to these conferences have been nominated by national organizations in the fields of agriculture, business, civic, fraternal and professional groups, labor, religion, parents and women. State and local safety organizations have been asked to name a limited number of delegates and state chairmen have prepared a special list of business leaders.

Public officials met in Washington in December and are not being invited to the four regional conferences. This has caused some misunderstanding among public officials, since it constitutes a change from earlier conferences of this type.

Conference objectives are to mobilize wider and more effective public support for the President's Highway Safety Action Program—especially the priority needs as determined by the December 1957 conference of State and local officials. Specifically, each conference will be designed to:

A. Focus the widest possible public attention on the urgent traffic-safety needs of each state and its local communities.

B. Encourage and assist existing citizen organizations to develop more citizen support for priority needs in each state and its local communities.

C. Strengthen existing safety organizations, and assist the formation of new ones where required, so that citizen support for the program will be continuous and effective.

Traffic Engineering Training Begun In Australia

The School of Traffic Engineering has been established in Australia at the New South Wales University of Technology as the result of a gift from the Australian Automobile Association. Professor W. R. Blunden is in charge of the traffic engineering program. Professor Blunden is known to a number of U. S. traffic engineers as the result of several months which he spent in this country in 1956-57.

Three main divisions of the program are being planned. At the under-graduate level, there will be a short course in traffic engineering fundamentals. The main course, which will cover the field of traffic planning and control, will be a formal graduate program. A third division will include research programs leading to higher degrees in engineering or science.

It is estimated that there is currently the need for the services of from 60 to 100 qualified traffic engineers in Australia. It is hoped that this new program will help fill this need.

Northwestern Announces Police Fellowships For 1958-59

Northwestern University Traffic Institute has announced that 32 fellowships and scholarships are available for a 9-months course in Traffic Police Administration. The program, to begin September 1958 and to end in June 1959, is made possible by funds from the Kemper Foundation for Traffic Safety.

Sixteen fellowships and 16 scholarships are available to departments with candidates who can qualify. Awards are available for municipal police as well as state and county officers.

This course is designed specifically to meet the needs for comprehensive professional training for senior officers in command or advisory positions, for those for whom promotion to such positions is definitely contemplated and to present or potential departmental training school directors. While there are no academic prerequisites, applicants must be police officers in active service, and had at least three years of police experience, be under 45 years of age and meet other requirements set by the program.

Applications should be forwarded to the Traffic Institute before May 15, 1958. Application forms are available from the Institute at 1804 Hinman Avenue, Evanston, Illinois.

Garden State Parkway Reports Low Death Rate Again

The Garden State Parkway, 173-mile toll road in New Jersey, has reported low death and accident figures again for 1957.

Chairman Katherine E. White of the New Jersey Highway Authority today reported that the Parkway completed the year 1957 with an accident rate of 65.1, an injury rate of 38.9, and a fatality rate of 1.3, each per 100,000,000 vehicle miles.

In 1956 the accident rate was 69.1; the injury rate was 54.1; and the fatality rate was an identical 1.3 per. The corresponding 1955 rates were 58.4; 50.9; and 1.2 respectively.

There were 14 fatal accidents resulting in a total of 19 deaths during the past year on the Parkway. All involved single vehicles except one. In 1956, when there were 12 fatal accidents and 13 deaths, seven of the mishaps involved single cars.

Four of the deaths in 1957 resulted from the crash of a bus after a tire blow-out last August 18th, and another four of the fatalities were pedestrians despite the Parkway ban against walking or hitchhiking.

A total of 60,708,485 vehicles was recorded at Parkway toll areas last year as compared to 51,345,953 in 1956. These totals do not include traffic on the free sections.

A total of 1,448,287,000 vehicle miles was traveled on the Parkway in 1957 as compared to 996,915,000 the year before. Those mileage totals include both toll and free traffic using the main roadways of the entire Parkway but not the exit-entrance ramps or spurs.

There were 942 reported accidents—both minor and serious—last year as against 689 the year before. There were 561 persons injured in accidents compared to 540 the year before.

The volume of traffic and the total of miles traveled on the Parkway increased substantially last year. The increase was partly due to the opening last July 3rd of the new 9-mile section in the north which links the Parkway directly with the New York State Thruway at the N.J.-N.Y. line.

Conference on Skid Prevention Proposed

The University of Virginia has offered to sponsor a conference on skid prevention, September 8-12, 1958 which would include technical papers on the skid resistance characteristics of materials used in highway construction and the extent to which these properties diminish with use. Friction of various natural and synthetic rubbers, brake action and weight distribution also would be discussed.

TV CONTROLS TRAFFIC IN ENGLAND

A TV traffic control system tried out since August 1956 is now claimed a success by the city of Durham, England. Miniature cameras of closed-circuit industrial television, equipped with screen wipers, demisters and defrosters, are sighted on the approaches to two bridges. Their images are conveyed to a kiosk where a "Bobbie," snug and comfortable in all weathers, controls three sets of traffic lights, even though two are out of sight. Twelve thousand vehicles a day pass through the TV controlled area. Picture shows: LEFT: The "Bobbie" and his receiving set in the kiosk. RIGHT: One of the TV cameras on its tail post to overlook the traffic.

Pedestrians Can Turn Traffic Light Green

A new traffic signal device that enables pedestrians to change the traffic light green by themselves when they want to cross the street with a heavy traffic volume of motor vehicles has recently been set up at a crossing near the Nijubashi bridge of the Imperial Palace in Tokyo.

This device, called the Pedalling System, has been made by the Metropolitan Police Department at a cost of six million yen to make pedestrians cross the carriage-way in safety.

An iron pedal that works by a spring is laid close to the curbstone of the sidewalk. When any pedestrian gets on it and remains thirty seconds, the light of the beacon set up at the opposite side of the street changes to green for thirty seconds or so and the light for motorcars changes to red.

Thanks to this device, traffic accidents at this crossing where average 60,000 vehicles pass a day so ceaselessly that pedestrians have felt much difficulty in crossing the street, can be prevented. Now, many sightseers and pupils on educational excursion to the Nijubashi bridge can cross the road without anxiety.

The most important part of mechanism placed under the pedal is waterproofed with rubber packing. These improvements have been made, under the direction of the M.P.D., by the Japan Signal Company and the Kyosan Manufacturing Company.

—Reprinted from Tokyo Municipal News

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1957 PROCEEDINGS

Institute of Traffic Engineers

ANNUAL MEETING

DETROIT, MICHIGAN

September 1957

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The light of a beacon at the opposite side of the street turns green when pedestrians tread on iron pedal laid on the sidewalk.

Police Short Courses Offered by Northwestern

A series of short courses in the key phases of police traffic supervision will be offered during April and May at the Traffic Institute of Northwestern University, Evanston, Ill.

Open to supervisory and administrative police personnel, the training program will include three-week units in traffic law enforcement, in accident investigation, and in traffic control. In addition, an "overview" course will be offered covering all three areas.

"Traffic Law Enforcement—Administration and Techniques," scheduled for April 21 to May 9, will begin the series. It will deal with ways of improving enforcement effectiveness through supervision and training. Subjects will include: traffic patrol techniques, apprehension of violators, officer-violator contacts, special enforcement activities, and the legal and management aspects of enforcement.

Eligible to attend are supervisory and command personnel responsible for planning, directing, or supervising police traffic law enforcement, and officers to be promoted to these positions.

"Accident Investigation — Administration and Techniques" will be conducted May 5-23. Officers will be shown how the amount and kind of information gathered at accident scenes can be improved through supervision and training. They will also study the actual procedures of scientific investigation, such as utilizing skidmark evidence, locating and questioning principals and witnesses, and effective use of scientific aids.

Eligible are command, supervisory, and training personnel, officers in charge of accident investigation units, and officers to be assigned to these duties.

"Traffic Law Enforcement" and "Accident Investigation" may be attended in succession by the same officer in a period of five weeks, at a reduced tuition of $205. Tuition for each course separately is $135.

"Traffic Control—Devices and Methods for Police," scheduled for May 5-23, will cover the third major area of police traffic supervision: planning for the orderly control and direction of traffic flow in the community. It is open to officers assigned to work with traffic engineering personnel, supervisors of officers on intersection duty, and traffic division commanders. Tuition is $135.

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Here's a new all-aluminum sign developed especially for the large signs required on major expressways. The "Increment Sheet Sign" consists of aluminum increment sheets hung vertically on a supporting frame. It can be made in any height or width, and for ground or overhead installation. Each sheet engages with the adjacent sheet, providing a smooth-faced sign panel.

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Meanwhile a three-week course in "Fundamentals of Police Traffic Service" will be offered April 28 to May 16 for officers of limited traffic experience or training. It will provide a broad survey of the major police traffic functions, plus insights into the management side of traffic supervision. This course is recommended as a comprehensive introduction to the police traffic field. Tuition is $135.

All classes will be held at the Institute Training Center, just south of the Northwestern University campus. Applications should be addressed to the director of training, Traffic Institute of Northwestern University, 1804 Hinman Ave., Evanston, Ill.

Final Program Issued for Int'national Study Week

The final printed program for the Fourth International Study Week in Traffic Engineering scheduled for September 16-21 in Copenhagen has been issued and copies have been received by the office of the Institute of Traffic Engineers in Washington. Anyone interested may obtain a copy by writing to Institute headquarters.

New Publications

Engineering College Research Review
Engineering College Research Council of the American Society for Engineering Education. 1957. 355 pp. & index. $2.00.

The 1957-1959 edition of the ECRC *Engineering College Research Review*, covering investigations representing more than 100 million dollars and the efforts of over 15,000 faculty members, graduate assistants, and research engineers in 110 member institutions, is now available. It provides an exhaustive analysis and location guide for engineering and associated science research activities and capabilities in colleges and universities throughout the country. As such, the volume is a unique and necessary repeated-reference tool for both college and industry libraries, for placement of research contracts or inquiries, and for individual research workers and teams.

An official ASEE contribution of the ECRC, the *Review* is edited by Renato Contini of New York University. Copies, order blanks, and further information can be obtained from Renato Contini, ECRC Secretary, University Heights, New York 53, New York.

Parking Dimensions—1958 Model Cars
AMA Engineering Notes No. 81, Automobile Manufacturers Association, 320 New Center Bldg., Detroit 2, Michigan. Folded sheet.

The AMA has tabulated dimensions of 1958 U. S. pasenger cars and published the information for the use of engineers, parking garage and lot designers and operators and public officials.

Included are width and length figures, road clearance and over-all heights, as well as angles of approach and departure, ramp breakover angles and turning diameters.

Better Transportation for Your City
National Committee on Urban Transportation, Public Administration Service, 1313 E. 60th St., Chicago 37, Illinois. 1958. 112 pp., indexed. $5.00

This publication is the first completed work of the National Committee on Urban Transportation and is a basic Guide Manual for the entire program. The Guide Manual is designed for use by public officials and interested citizens. It presents in simple and direct style, methods for organizing and carrying out an urban fact-finding and transportation planning program.

The National Committee on Urban Transportation was organized in 1954 by representatives of six national organizations, the International City Managers' Association, the American Municipal Association, American Public Works Association, American Society of Planning Officials, Municipal Finance Officers' Association, and the National Institute of Municipal Law Officers. Later these organizations were joined by the Bureau of Public Roads, the National Association of County Officials and the Canadian Federation of Mayors and Municipalities.

The objective of the Committee has been to develop a manual of methods and procedures by which cities could undertake a complete fact-gathering program to help officials evaluate deficiencies, project future needs and formulate a more realistic transportation policy. A preliminary manual was completed early in 1956 and seven pilot cities were selected to test the methods and procedures developed. The present work is the result of this pilot study experience.

Planned for future issuance is a series of procedure manuals. The first 15 will be available this spring from the Public Administration Service, and six more are in preparation for future publication. All those receiving the basic Guide Manual will be advised when these additional publications are available.

New Appointment

Zimmerman Named Director of New Calumet Skyway

John W. Zimmerman, (Assoc. Mem., ITE) has been appointed director of the Calumet Skyway, the first toll express facility in the Chicago area. The Skyway, which is scheduled to be opened for traffic in April, 1958, is a 6-lane, 7½-mile long elevated expressway, and was built to provide a connection between Chicago's expressway system, now under construction, and the Indiana Toll Road. As Engineer-Manager for the Skyway, Zimmerman will be attached to the Public Works Department of the City of Chicago,

John W. Zimmerman

and will be in charge of all Skyway operation and maintenance.

Born and raised in Chicago, Zimmerman attended the Armour Institute of Technology, and in 1935 was employed by the newly-formed Traffic Engineering Section of the Chicago Park District. Under the jurisdiction of this group was North and South Lake Shore Drive, one of the country's first expressways, and Chicago's famed boulevard system.

During World War II Zimmerman was an Army Captain, serving as traffic Control Officer and Traffic Engineer for the Third Army in Europe. Since 1950, he has been Assistant Traffic Engineer for the Chicago Park District. Active in the affairs of the ITE's Midwest Section, he is now serving this year as President of the Section.

Coming Events

April 14-17 — GREATER NEW YORK SAFETY COUNCIL CONVENTION —
Statler Hotel, New York, N. Y. Contact: Greater N. Y. Safety Council, 60 E. 42nd St., N.Y.C.

May 18-22—AMERICAN SOCIETY OF PLANNING OFFICIALS—
Annual Conference, Hotel Statler, Washington, D.C. Contact: Dennis O'Harrow, ASPO, 1313 E. 60th St., Chicago 37, Ill.

August 10-13 — NATIONAL ASSOCIATION OF COUNTY OFFICIALS —
Annual Conference, Hotel Multnomah, Portland, Ore. Contact: NACO, 1721 DeSales St. N.W., Washington 6, D.C.

August 17-22 — ILLUMINATING ENGINEERING SOCIETY—
National Technical Conference, Royal York Hotel, Toronto, Ont. Contact: IES, 1860 Broadway, N.Y. 23, N.Y.

September 11-13 — U. S. CONFERENCE OF MAYORS —
Annual Conference, Roosevelt Hotel, New Orleans, La. Contact: U.S. Conf. of Mayors, 730 Jackson Pl., Washington 6, D.C.

September 14-19 — AMERICAN ASSOCIATION OF MOTOR VEHICLE ADMINISTRATORS —
Annual Meeting, Fairmount Hotel, San Francisco, Calif. Contact: AAMVA, 912 Barr Bldg., Washington 6, D.C.

NIGHT SAFETY THROUGH BETTER VISION

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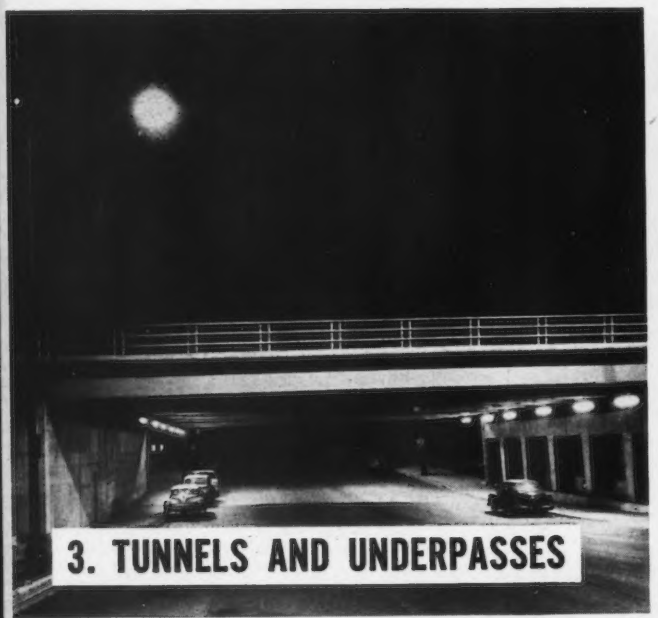

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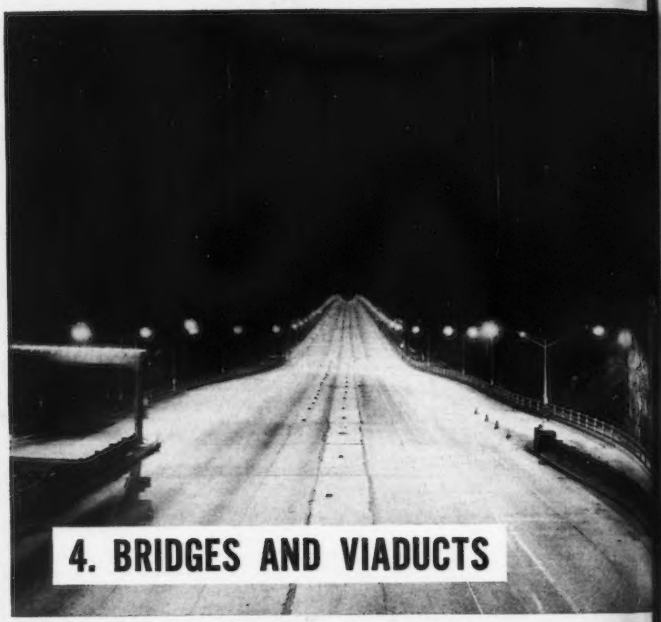
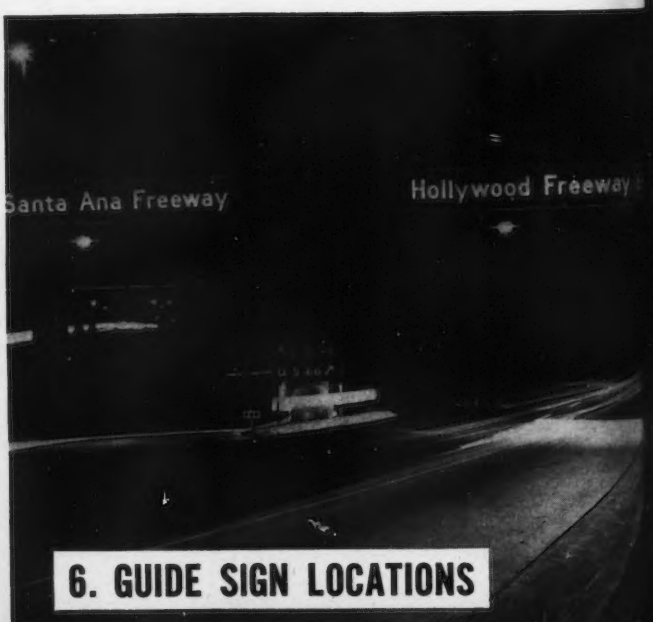
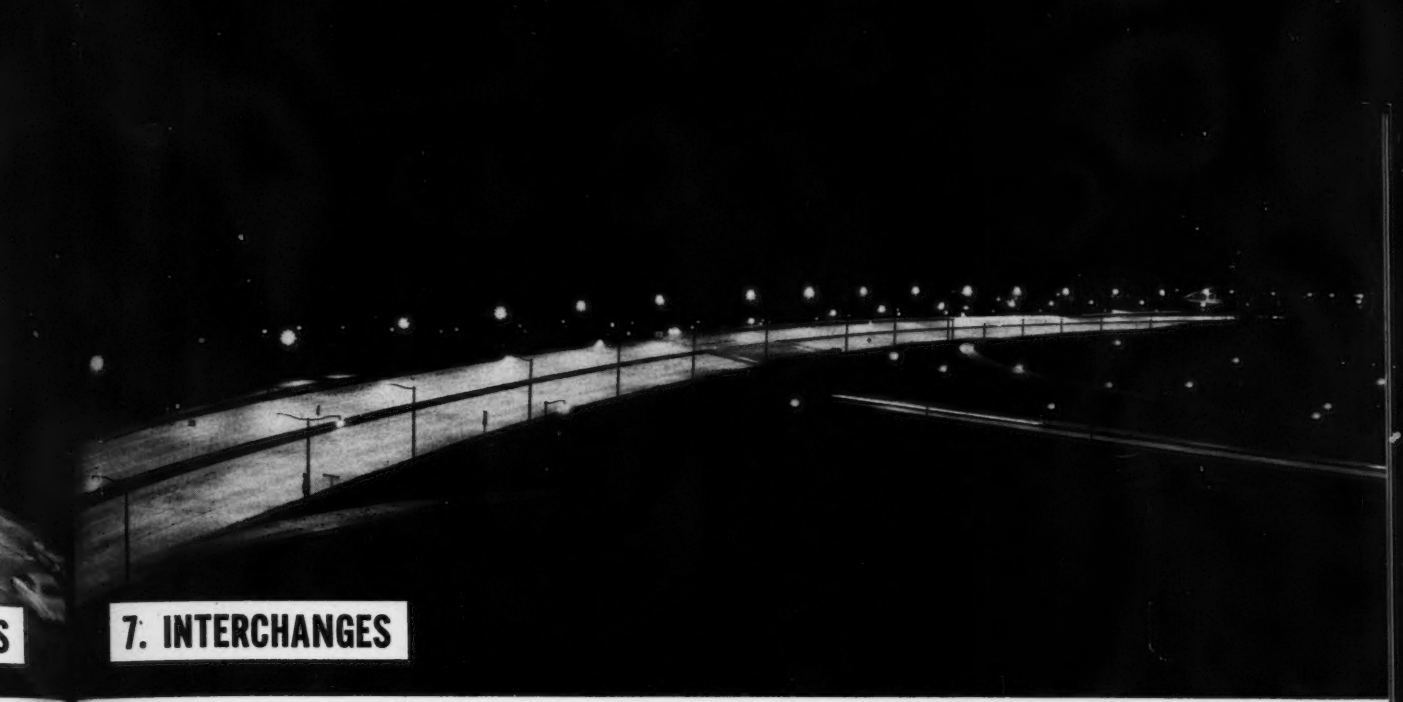


4. BRIDGES AND VIADUCTS

5. INTERSECTIONS



6. GUIDE SIGN LOCATIONS



7. INTERCHANGES

Add night safety to your highways by lighting the seven deadly areas with General Electric highway lighting

Twenty-two thousand deaths . . . 750,000 injuries . . . $2\frac{1}{2}$ billion economic loss! This was the toll of *night* traffic accidents on the nation's highways in 1956.

How can these staggering figures be reduced? Conservative estimates indicate that adequate lighting for highways would cut night accidents—and resultant loss of life and property—by at least one-half. More than 10,000 lives would be saved each year.

Accident studies reveal *seven deadly areas* on modern roadways. Wherever traffic converges, slows, or speeds, accidents most often occur. These areas, shown here, are the locations for which General Electric recommends modern highway lighting.

Present-day speeds of 50 to 60 mph demand that highways furnish every possible assistance to the vehicle operator, especially at areas of driver decision. The extra time afforded by better visibility aids the driver in making correct decisions. This is the primary role of roadway illumination.

Proper lighting after darkness improves the usefulness of the entire roadway. Increased, yet smoother-flowing, traffic results because (1) use of highway is encouraged on a 24-hour basis, (2) lane capacity is more fully utilized, and (3) higher speeds are permissible without loss of safety.

The beginning of the greatest building project in history was signaled by the passage of the Federal Aid Highway Act of 1956. Key areas along 41,000 miles of superhighways need the safety and traffic-expediting benefits which light brings.

Get full information today about General Electric's complete lines of highway lighting luminaires and control equipment by contacting your nearby Apparatus Sales Office. Or, write to Section 455–19, General Electric Company, Schenectady, New York.

Put General Electric's 30-plus years of highway lighting experience to work in helping make your roadways safer and more efficient!

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September 16-20 — FOURTH INTERNATIONAL STUDY WEEK IN TRAFFIC ENGINEERING—
Copenhagen, Denmark. Contact: World Touring and Automobile Organization, 32 Chesham Place, London, SW1, England.

September 28 - October 1 — AMERICAN PUBLIC WORKS ASSOCIATION—
Muehlebach Hotel, Kansas City, Mo. Contact: APWA, 1313 E. 60th St., Chicago, Ill.

October 13-15 — AMERICAN TRANSIT ASSOCIATION—
Roosevelt Hotel, New Orleans, La. Contact: ATA, 292 Madison Ave., N.Y.C.

October 13-17 — AMERICAN SOCIETY OF CIVIL ENGINEERS—
National Convention, Statler Hotel, New York City. Contact: ASCE, 29 W. 39th St., N.Y.C.

October 20-23 — INTERNATIONAL MUNICIPAL SIGNAL ASSOCIATION—
Sheraton Hotel, Philadelphia, Pa. Contact: IMSA, 130 W. 42nd St., N.Y.C.

October 20-24—NATIONAL SAFETY CONGRESS
Conrad Hilton, Congress and other hotels, Chicago, Ill. Contact: NSC, 425 N. Michigan Ave., Chicago 11, Ill.

October 26-31—INTERNATIONAL ASSOCIATION OF CHIEFS OF POLICE —
Hotel Fontainebleau, Miami Beach, Fla. Contact: IACP, 618 Mills Bldg. N.W., Washington 6, D.C.

November 10-14 — INSTITUTE OF TRAFFIC ENGINEERS—
28th Annual Meeting, Deauville Hotel, Miami Beach, Florida. Contact: ITE, 2029 K St.,NW, Washington 6, D.C.

November 28-December 5—AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS—
Annual Meeting, Sheraton-Palace Hotel, San Francisco, Calif. Contact: AASHO, National Press Bldg., Washington 4, D.C.

November 30 - December 3 — AMERICAN MUNICIPAL ASSOCIATION —
Hotel Statler, Boston, Mass. Contact: AMA, 1625 H Street N.W., Washington 6, D.C.

Training Opportunities

July 7-19 — INTRODUCTION TO COMPUTER METHODS FOR HIGHWAY AND TRAFFIC ENGINEERS—
To be held at Yale University, New Haven, Connecticut, under the joint auspices of the Yale Bureau of Highway Traffic and the Institute of Transportation and Traffic Engineering of the University of California. Tuition $150. Registration limited. For information, write: Director, Bureau of Highway Traffic, Strathcona Hall, Yale University, New Haven, Conn.

1958
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Miami Beach, Florida
DEAUVILLE HOTEL
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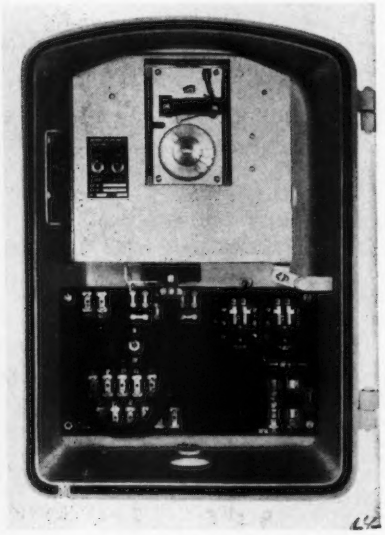
Mark the Date in '58!

New Marbelite Single-Dial Controller Improves Traffic Flow

A 5 to 15 per cent increase in traffic flow, with fewer tie-ups and accidents, is reported by communities installing the new Marbelite M-20 Single-Dial Controller, according to the Marbelite Company, Inc., Brooklyn, N. Y.



Civic officials concerned with improving traffic control efficiency will be interested in the unit's versatility. It not only covers current needs, but can be readily adapted to handle increased loads and changing patterns in the future, such as those caused by industrial and residential expansion and relocation.

The M-20's flexibility stems from unique design, which permits simplified set-up as a master secondary for intersections, or control of other secondary controllers in the system. It can also be smoothly integrated into another system as a secondary controller. 15 signal circuits, in combination with up to 3 offsets, provide a wide range of control as an interconnected secondary.

Remote control of flashing, emergency all-red, or signal shutdown is available, plus the choice of a synchronous motor-driven jack mounted flasher or an integral flasher in the dial unit. The dial unit is supplied with five cycle gears, each ranging from 30 to 120 seconds in 5 second steps. Signal switching is accomplished with the new motor-driven camshaft, which is shockless and vibration-free.

For full information, write Marbelite Company, 179 N. 10th St., Brooklyn 11, N. Y.

First Highway Lighting Institutes Conducted by General Electric

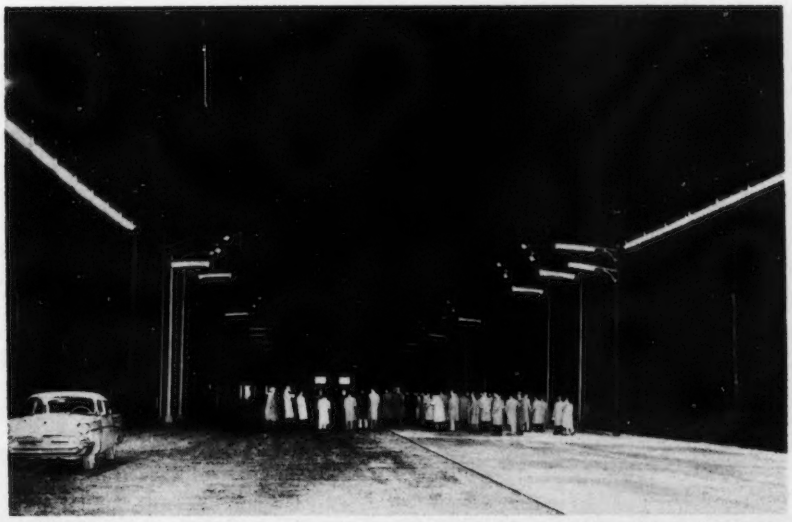
The nation's first Highway Lighting Institutes were held in February at General Electric's Outdoor Lighting Department, Hendersonville, N. C.

A total of 79 representatives of the U. S. Bureau of Public Roads, 30 states, the District of Columbia, and Puerto Rico attended the two three-day sessions which were designed to familiarize members of state highway departments and the BPR with highway lighting systems and modern design concepts that can be used to help provide maximum nighttime safety at the "seven deadly areas of driver decision" on the 41,000-mile federal highway network.

Attendees received an indoctrination in basic highway lighting system design and application and participated in workshop sessions devoted to the design of typical lighting systems for intersections, cloverleafs, tunnels and underpasses, bridges and viaducts, heavily-traveled urban highways, guide signs, and access roads.

COFFEE BREAK—During a recess in the Highway Lighting Institute, Walt Schwanhausser of General Electric's Outdoor Lighting Department (center) explained the company's new Highway Lighting Manual to J. E. P. Darrell, traffic and planning engineer, Minnesota State Highway Department (left), and Rex G. Still, traffic engineer, Washington State Highway Department.

General Manager Joseph T. Bailey of the Outdoor Lighting Department hailed the institute as "a successful beginning in helping state and federal highway officials solve the problem of lighting portions of the vast national highway system," and commented that similar technical institutes will probably be held at Hendersonville in the future.



"CROSSROADS OF LIGHT"—A feature of the recent Highway Institutes conducted by General Electric's Outdoor Lighting Department was a dramatic nighttime demonstration of the effects of more than 30 different lighting systems at the company's "Crossroads of Light." In photo above, attendees witness a comparison of two types of lighted guide signs at the end of one section of the test facility. To the rear of the group is an installation of parallel-to-roadway fluorescent lighting.

Now motorists can phone from their cars with the new drive-up booth being manufactured by Suttle Equipment Co., Lawrenceville, Ill. The booths are easily visible day or night. Optional lights can be installed in the concrete base or suspended from the sign post. Lighted or Scotch-Lite signs are also available at additional cost. Telephone company subscribers should contact their local telephone company for further information or write Suttle Equipment Co., 135 S. LaSalle Street, Chicago 3, Illinois.

Safety of Cable Guard Reported By U. S. Steel

Safety of highway cable guard has been reported by U. S. Steel's American Steel and Wire Division.

In order to determine how much punishment a properly-installed guard could absorb, the company from 1934 to 1938 deliberately crashed 146 automobiles into all manner of guard rails at its proving ground at Worcester, Massachusetts.

Every effort was made to simulate actual road conditions. Sandbags were placed in the cars in place of passengers. The automobiles travelling at speeds of 40-50 miles an hour and higher hit the railing at the most severe possible angle.

Kansas Turnpike cable guard after 95 mph impact. Note broken post (one of six) but the undamaged cables.

It was found that a three-cable guard, mounted on resilient offset spring brackets, could easily resist the impact of a car travelling 50 miles an hour. In fact, damage to the guards was generally so minor that it could be repaired in less than half an hour. The automobiles sustained only minor damage and were deflected back onto the test runway with indications of little probable injury to passengers.

Tests on four-cable resilient offset guards were equally successful. With a 60-mile-an-hour impact, a guard has to withstand a deflecting force of 132,089 pounds.

It was not determined with finality the total amount of punishment these resiliently-mounted cables can absorb. However, there have been numerous instances in which these highway sentries have turned in amazing performances.

In November, 1956, a late model car—its driver asleep at the wheel—crashed into a cable guard over a deep ravine on the Kansas Turnpike at 95 miles an hour. Though six posts were broken off as a result of the impact, not a single wire in the three guard cables was broken, and the car did not overturn. Tragically, a passenger in the car was killed when the right-hand door was sprung open and he was thrown to the ground. However, the driver rode out the crash and was not injured.

While no guard rail is designed specifically to withstand 95-mile-an-hour impacts, the fact that this tremendous force was absorbed by the cable guard offers dramatic evidence of the protection afforded by this type of guard rail, according to the manufacturer.

Transistor Barricade Package Unit Available

Announcement was made by Neo-Flasher Manufacturing Company of a combination transistor warning light and collapsible barricade unit called the Neo-Flash-Cade.

Three models of the Neo-Transistor Warning Lights are available for use with the barricade:

The TR 1-100 with a 360° lens and 8 beam candle power.

The TR 0-100 with a 2 direction lens and 8 beam candle power.

The TR 4-100 super-brilliant light with a reflectorized head and 15 candle power.

All Neo-Transistor Lights are weathertight, compact, lightweight, and

can be easily locked to any barricade or sign. These models have no moving parts and will operate on two 6-volt lantern cell batteries for 2200 hours continuously (90 days and nights), and with an 85 per minute flash rate.

The TR 4-100 is used primarily to slow down fast moving traffic in congested areas, since its super-brilliant flash is clearly visible for more than two miles. The other models, TR 0-100 and TR 1-100, are used to delineate the job after traffic has already slowed down.

The versatile all-metal barricade is collapsible, light weight yet rugged, and will not blow over in heavy winds. Attached to the barricade is a 36″ × 18″ swinging metal panel which has four 2″ Scotchlite stripes on each side for maximum reflectorization.

For further information, write to: Neo Flasher Manufacturing Company, 3210 Valhalla Drive, Burbank, Calif.

TURBINE INTERCHANGES

(Continued from page 21)

Feeder Roads

A special application of the turbine principle to intersections of a superhighway with a feeder or other secondary road is shown in Figure 5. The feeder road is not handled as a separate through roadway. Its through traffic (SN) enters the rotary roadway together with the left-turning traffic (NW) at the crossover (4) to the left-turning roadway (WN) from the main highway. This provision for crossing over has been pointed out before as an advantage for drivers who lose their way. In the case of the feeder road, however, the crossover eliminates one structure and reduces two more structures to

cross one instead of two roadways.

Considering through traffic as the main traffic stream this layout no longer provides entrances and exits from the outer, right-hand side of the roadway on the feeder road.

There are however still no weavings or hidden intersections within the interchange.

Curved Main Road

It is not absolutely necessary that the main road be straight through. It could be curved (for instance SE). Such layout still requires two large and two small bridges, yet it eliminates one left-turning roadway which is led through the center as the through road.

This design mainly serves to illustrate how versatile interchanges of the turbine principle can be if special requirements are considered.

Simplified Feeder Road

In order to eliminate two of the four bridges that were necessary in the previous designs, some interfering traffic may be required to weave.

In Figure 6 there are four weaving sections. (These could be reduced to two with little change in the design, yet the number of weaves would remain the same.) As demonstrated on the flow sketch, the left-turns from the feeder road each have to weave with three other traffic streams, the through traffic on the feeder road and the left-turns from the main road each have to weave once.

This layout therefore has little advantage over the cloverleaf in terms of weaving. The separation of the structure into two one-way bridges and the necessary curvature for the through traffic of the feeder road are definite disadvantages of this design. Provision of a continuous rotary provides somewhat more flexibility to the layout.

Turbine Rotary

As a last design in this series the turbine rotary without through roadway should at least be mentioned. In contrast to the standard turbine this design leads all entering roadways into the centre, thereby eliminating all weaving. This rotary has an unlimited capacity as long as the roadways are sufficiently wide.

Its main advantage is the possibility of converting existing rotaries which are very inadequate into turbines by adding the separate entrance roadways.

Conclusions

The turbine interchange is an improved rotary interchange. The left-turning traffic enters the rotary from the inside and leaves it from the outside, thereby eliminating all weaving or crossing of traffic streams.

This design, although expensive in construction, is especially adaptable for intersections with large volumes of turning traffic, such as suburban intersections, connections of feeder roads with superhighways, and one - way street intersections in cities.

The turbine is more versatile than it seems at first. It can be built in stages or existing rotaries can be converted into turbine rotaries by adding the entrance ramps and grade separations.

Letters to Editor

Sir:

Our experience with the construction and operation of freeways in the City of Detroit indicates that the IACP is justified in asking for consideration in the planning and design of such facilities.

Traffic engineers in the past were in somewhat the same position as the police find themselves in at this time. Up until recently, traffic engineers had little voice in the design of highways and consequently were faced with problems which could have been eliminated had the traffic engineer been given the opportunity to study the construction plans before contracts were let.

Police patrol and enforcement are necessary to the success of our freeways and limited access highways. If these facilities are designed so that the police have difficulty in carrying out these duties the efficiency of the highway will be impaired, and a portion of our investment in these modern facilities will have been wasted.

The Institute of Traffic Engineers as an organization recognizes and appreciates the role of the police in the design and operation of controlled access facilities. The program of the proposed freeway operations seminars will include police officials who will discuss the problem of police and other emergency services crossing and gaining access to freeways, police assignments and methods, and other phases of the police problem which are created by the construction of these facilities. They will also afford police officials in attendance an opportunity to indicate special problems. We would expect the highway officials would include not only the traffic engineer when planning high-type facilities, but also those police officials who will be charged with the policing and enforcement of the highways.

A. F. MALO

Detroit, Michigan
March 5, 1958

Dear Dave:

Thought that I would say hello again after all these months. Time flies, and I am over "the hump" with my tour in Vietnam. But, the experiences are tremendous.

Last November, Jeanette and I went to Cambodia for a few days where we visited Phnom Penh and Anghor Wat, the home of the ruins of an ancient civilization. It is truly one of the wonders of the world.

Last month, together with some Vietnamese I went to a United Nations (ECAFE) meeting in Bangkok where the Inland Transportation Committee spent several days reviewing the work of "working committee reports." There was a very detailed report submitted on traffic responsibilities, and one of the major recommendations was the scheduling of a seminar similar to the European ones. It tentatively is set for the latter part of 1958 in Bombay. I hope that I will be able to attend.

We are now working on the first "Rules of the Road" in Vietnam. In the past they have been working on the Vehicle Code, but it is of French extraction, and they want to start anew. We welcome the idea but have problems as usual with language. It is very difficult to take technical English, put it into explainable French, and then back into technical Vietnamese which is still a growing language as far as vehicle terms go.

Next week I hope to go to Hue about 800 miles north of here, just south of the 17th parallel. It is the ancient city of Vietnam and has a large population. We go up as a team and each man teaches and demonstrates his specialty.

Our family is fine, and the daughter is continuing to blossom, in accordance with her Vietnamese middle name of "lovely lotus flower."

Regards and please keep us informed.

/s/ Jerry
JEROME D. FRANKLIN

Saigon - Vietnam
March 1, 1958

Institute Affairs

COLUMBUS SEMINAR PROGRAM ANNOUNCED: SECOND SEMINAR SCHEDULED

As most members of the Institute know, the first Freeway Operations Seminar is to be held in Columbus, Ohio on April 23, 24, and 25.

A distinguished group of speakers has been developed for the Columbus meeting. Included are:

President Joseph E. Havenner
A. E. Johnson, Executive Secretary of AASHO
D. W. Loutzenheiser, Chief, Highway Design Div., U. S. Bureau of Public Roads
A. F. Malo, Director, Detroit Department of Streets & Traffic
Burton W. Marsh, Director, Traffic Engineering & Safety Dept., American Automobile Association
Charles M. Noble, Ohio Director of Highways
O. K. Normann, Deputy Assistant Commissioner for Research, U.S. Bureau of Public Roads
Edmund R. Ricker, Traffic Engineer, New Jersey Turnpike Authority
Lt. John L. Bishop, Commanding, Turnpike District, Ohio State Highway Patrol
Sr. Inspector William H. Polkinghorn, Detroit Police Department
Arnold G. Fisch, Traffic & Safety Engineer, New York State Thruway
Carlton C. Robinson, Traffic Engineer, Automotive Safety Foundation
Harold G. Eckhardt, Chief Traffic Engineer, Ohio Dept. of Highways.
Benjamin J. Bowman, Traffic & Safety Engineer, Ohio Turnpike Commission.

Invitations have been extended to Institute members in the five-state area of Ohio, Indiana, Michigan, Kentucky and West Virginia, and it is hoped that many of those with freeway responsibilities will attend. A top limit has been set on registration, however, and it may be that not all applications can be accepted. Those who must be refused will be notified promptly and their names listed for consideration at another seminar.

A second seminar has been scheduled for Sacramento, California on June 16-18. This will immediately precede the meeting of the Western Section, scheduled for the end of that week.

Attendance for the Sacramento seminar will be sought principally from the Northern California area, although it is recognized that many ITE members from the 11-state area will be in Sacramento and may want to attend this seminar. Program details are not yet completed, but a number of the speakers who participated in the Columbus seminar will also participate in the Sacramento seminar.

One or two more seminars are planned for 1958, perhaps in the New England area and in the Southeast. Both the New York Metropolitan Section and the Southern Section have indicated interest in sponsoring seminars this year. Additional seminars are expected in 1959, scheduled throughout the country so that few individuals will have to travel more than 300 miles to attend.

Past Presidents' Award Committee Solicits Entries

The 1958 Past Presidents' Award Committee is preparing its plans for a campaign designed to bring in at least as many entries as were received last year when 17 fine papers were received.

The Committee this year is under the chairmanship of J. Carl McMonagle, and includes as members Burton W. Marsh, D. Grant Mickle, and Charles W. Prisk.

The competition is open to all Junior and Associate Members of the Institute who are under 35 years of age. A written report, in quadruplicate if possible, should be submitted, reporting independent and original research conducted by the member. The paper may have been previously published, if publication occurred within the past three years. The CLOSING DATE IS SEPTEMBER 11, 1958, which is two months prior to the opening of the Annual Meeting.

It is planned that the winner will be given an opportunity to present his paper at the opening technical session at Miami Beach.

For further information, contact either Chairman McMonagle or the office in Washington.

Obituary

H. K. PERKINS, JR.

Hubert K. Perkins, Jr. (Assoc. Mem., ITE) died March 8 as the result of a shooting accident at his parents' home in Richmond, Virginia.

Perkins, who was 32 years old, was Richmond's city traffic engineer at the time of his death. He had worked for the city since 1954, first as assistant and then as acting traffic engineer. Prior to that he had been urban traffic engineer for the Virginia Department of Highways for five years.

A graduate of the University of Richmond, Perkins also did a year's graduate study at the University of Virginia in psychology.

Active in work of the Southern Section of ITE, he was also a member of the Board of Controls of the Richmond Area Safety Council, secretary of the Richmond Parking Board and the Richmond Traffic Committee, and director of Transportation for Richmond Area Civil Defense.

He is survived by his wife and four children.

First Insurance Claim Paid

In the last issue of the magazine, the death of Frederick S. Eckhardt, Associate Member of the Institute, was reported.

The Trustees of the Institute's life insurance plan report that Mr. Eckhardt was covered by the plan, and a check for $7500.00 has been delivered

(Continued on page 50)

first time ever

P&K

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Amazing. Here you see a sign span never before thought possible—over 10 lanes wide—with no center support—with all the strength you demand—and an ease of installation that is as amazing as its size.

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AND IT'S TASSCO FOR SIGNS

You can enjoy the advantages of dealing with an integrated organization too, because our associate, Traffic and Street Sign Company, manufactured the entire aluminum signing program for the Walt Whitman Bridge, and its nine miles of approaches. And, of course, they make an extensive line of traffic control signs for every application. For their catalog write for TSM.

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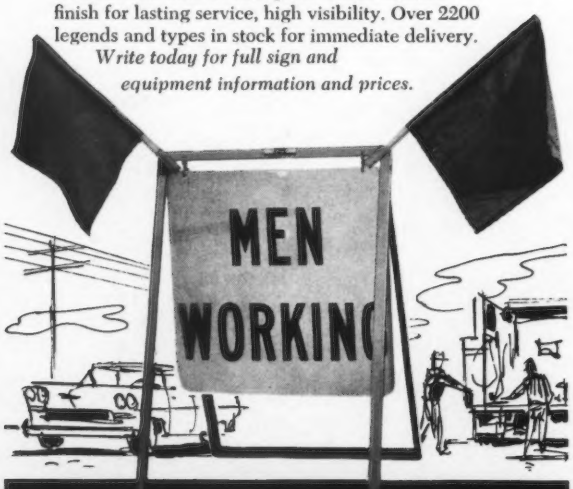

Eastern Metal
OF ELMIRA, INC.
140 Harrison St. Elmira Heights, N. Y.

Membership Applications

The following applications have been received since the list published in the March issue.

APPLICATIONS FOR TRANSFER

HEWTON, John T.
Operations Engineer, Municipality of Metropolitan Toronto, 171 Eglinton Avenue East, Toronto, Ontario, Canada. February 20, 1958 for ASSOCIATE grade.

OLIVER, Richard H.
Senior Traffic Engineer, Texas Highway Department, 11th & Brazos Streets, Austin, Texas. March 7, 1958 for MEMBER grade.

PETRILLO, Paul C.
Traffic Engineer, Automobile Club of New York, 1881 Broadway, New York 23, New York. February 13, 1958 for ASSOCIATE grade.

WATT, James E., Jr.
Traffic Engineer, Edwards & Kelcey, 470 Atlantic Avenue, Boston 10, Massachusetts. February 21, 1958 for ASSOCIATE grade.

WITHEFORD, David K.
Planning Engineer, Delaware State Highway Department, 152 South State Street, Dover, Delaware. February 25, 1958 for ASSOCIATE grade.

NEW APPLICATIONS

BALL, Ahmet Ishan
Traffic Engineer, Turkish State Highway Department, Karayollari 1. Bolge Md. Kucukyali, Istanbul, Turkey. February 19, 1958 for JUNIOR grade.

BERRY, Maurice
Traffic Engineer, Department of Traffic & Parking, 200 Orange Street, New Haven, Connecticut. February 27, 1958 for JUNIOR grade.

DeSHAZO, John J., Jr
Director of Streets & Traffic, P.O. Box 1971, Amarillo, Texas. March 10, 1958 for JUNIOR grade.

GARLAND, Cecil J.
Acting Traffic Engineer, City Hall, Moncton, N. B., Canada. February 17, 1958 for ASSOCIATE grade.

HAGER, William G.
Junior Traffic Engineer, Chicago Park District, 425 E. 14th Boulevard, Chicago 5, Illinois. February 24, 1958 for ASSOCIATE grade.

JACOBS, Myron M.
Assistant Professor, Civil Engineering Department, University of Santa Clara, Santa Clara, California. February 24, 1958 for JUNIOR grade.

MANTLE, Hamilton A.
Location Engineer, Ontario Department of Highways, Parliament Buildings, Toronto, Ontario, Canada. March 10, 1958 for MEMBER grade.

OPPENLANDER, Joseph C.
Traffic Planner, Allegheny County Planning Department, 416 County Office Building, Pittsburgh 19, Pennsylvania. March 7, 1958 for JUNIOR grade.

SANSOM, John H.
Research Engineer, Toronto Transit Commission, 1134 Bathurst Street, Toronto, Ontario, Canada. March 5, 1958 for ASSOCIATE grade.

SCHMELZKOPF, Philip C.
Traffic Engineering Assistant, Traffic Engineering Department, Room 501, City-County Building, Madison, Wisconsin. February 28, 1958 for ASSOCIATE grade.

TUCKER, William E.
Engineer Technician V, Colorado Department of Highways, 4201 E. Arkansas Street, Denver 22, Colorado. March 3, 1958 for JUNIOR grade.

WARDELL, Edward J.
Traffic Engineer II, Traffic Engineering Division, Port of New York Authority, 111 Eighth Avenue, New York 11, New York. February 14, 1958 for ASSOCIATE grade.

Memorandum

To: **JUNIOR MEMBERS OF ITE**
(and other grades too)

From: **ITE INSURANCE TRUSTEES**

Subject: **PROTECTION**
(life insurance, of course)

- Do you realize that the protection afforded by life insurance is most important to you when you are young and have many responsibilities without always having the financial resources which you hope to have in later years?

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- Do you know that the ITE offers you this protection for your family through guaranteed renewable term insurance, available to all members and affiliates at group life rates? For instance, you as a Junior member can have $5000 of protection for only $2.50 a month. This is a bargain that you cannot afford to pass up!

- Do you know that you can subscribe at any time by writing to the Trustees, completing the necessary application forms, and satisfying the insurance company that you are in good health?

- Do it today!

- P.S. *Use the coupon!*

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Washington 6, D.C.

I want to know more about life insurance for protection of my family.

Name _____
ITE Member or Affiliate

Section News

MIDWEST SECTION

February Meeting

On the evening of February 20th, thirty-eight Midwest Section members were entertained by some remarks from Miss Jeanne Smith, amid scenes of old Napoli in the Como Inn. Miss Smith is a safety consultant for the Dodge Division of the Chrysler Corporation. She explained some of the facets of her job, which include selling safety features from the woman's viewpoint, as well as feminine views of styling and color.

Her travels have taken her to various Dodge testing locations as well as to the crash test center at Holloman Air Force Base and the National Safety Council Winter Driving Test at Pine Lake, Wisconsin. Miss Smith showed a series of films of various Chrysler testing procedures and tests conducted at the Pine Lake site.

TE Conference at Illinois

The University of Illinois at Champaign-Urbana was the scene of the 10th Annual Traffic Engineering Conference, held on February 27th and 28th. The Midwest Section of the Institute of Traffic Engineers was a co-sponsor of the conference. Many Midwest Section members either attended or participated in the program.

The Traffic Conference Program Committee included Midwest members *Warren Kessler*, *Evan Olmstead*, and *John Zimmerman*.

Midwest members who served as chairmen of parts of the program were *Harry Harrison*, who presided over the session "Motor Vehicle Speeds—New Thinking on an Old Problem" and *Charles Michalski*, who presided over the session "Designing for Traffic Movement and Storage."

Midwest members who took part in the program and their subjects were as follows:

George Barton — Impact of Accelerated Highway Programs on Local Conditions

Mike Hartigan—Signing of Controlled Access Facilities.

Al Forde—Design Methods for Local Arterial Streets

Don Berry — Relation of Present Traffic Conditions to Future Design Considerations.

John Baerwald—Research

Matthew Sielski—The Police Interest in Traffic Problems and How About the Future?

Fred Kaiser—The Smaller City Needs a Traffic Engineer

A dinner meeting jointly sponsored by the Midwest Section and the Student Chapter of the Institute of Traffic Engineers at the University of Illinois was held at the Town and Country Steak House on Thursday evening, February 27th. *Gordon Lindquist* served as toastmaster. An entertaining skit was presented by the Student Chapter, with the Midwest Section's oldest juvenile delinquent, *Walter Jolesch*, contributing his dramatic talents.

OHIO SECTION

Conferences

Two conferences of importance to the Section and others are planned for April.

The first April conference will be held on Thursday, April 3rd, 8:45 A.M., in the Ohio Union Conference Theater at Ohio State University in Columbus, Ohio. It will be an all day event held jointly with the Ohio State Department of Highways. It is understood that some of the joint topics would include the following:

a. Signing of Interstate Highways.
b. Traffic Signal Systems.
c. Fundamentals of Traffic Engineering.

Charles M. Noble, State Highway Director, is General Chairman of this meeting.

Some time is being allocated also to a regular Ohio Section ITE business meeting —during the afternoon period. It is requested that each member come prepared with his ideas on possible changes in state legislation and be prepared to discuss the appointment of a District 3 director.

FREEWAY SEMINAR

The Ohio, Michigan, and Indiana Sections have been given the honor of sponsoring the first of a series of seminars to be held throughout the country under the parent sponsorship of the ITE Board of Directors. *George Howie* and our officers deserve a vote of thanks for bringing this opportunity to our sections. This seminar, however, will be a very special event with limited participation. Because it is a first attempt at this type of conference and because of the nature of the subject matter this seminar will be open only to a limited number of qualified representatives from the Tri-State area of Ohio, Michigan, and Indiana. A credentials committee is now screening a large list to select those who are primarily concerned with either design or operation of turnpikes and expressways, or both. If you are one who receives an official invitation to this 3 day conference, we hope you will attend to contribute your valued experience to its success. Incidentally, *Harold Eckhart* is General Chairman of this seminar with *Musick* and *Condrey* as aides.

Incidentally, one of the founder members of ITE, *Burton Marsh*, was principal speaker at a mid-January traffic seminar in Cleveland, sponsored as usual by *Bill Hammond* and the Cleveland Automobile Club. These seminars, held quarterly by C.A.C. pack a great deal of punch with interest to traffic engineers and officials. We wish more of you could attend them. *Bill Hammond* is to be congratulated for his continued high caliber programs and chairmanship at these meetings.

The "Brass Hats" also report that strong sentiment is building up for a return to the Potawatomi Inn near Angola, Indiana, for our next Tri-State joint outing. Is this also your wish? Or do you have another location to suggest? Let us hear from you. Again we urge you to point for this one. Bring your wife or sweetheart! (But *not both*!).....

New Parking Plan

Member Bob Kelly, Cleveland's Traffic Commissioner, has launched Cleveland on a program to provide off-street parking for outlying shopping and business areas. He has proposed a plan whereby property owners would first participate in the cost of developing a parking lot adjoining their properties and would subsequently be reimbursed the entire cost of their share of participation as parking fees are collected. The off-street parking facilities would be sponsored by and operated on behalf of the city. Thus far the response has surpassed all expectations.

Our spies report that member *Irwin Hart* spent a few days in New Orleans. It is understood that he got lost in the French Quarter. Was that accidental or deliberate, Irwin?

We were also advised that *Bob Kelly* is itching to get lost on winter week-ends, away from all traffic. He's been buying skis, ski shoes and the like. Sounds like a good idea.

SOUTHERN SECTION

The annual meeting of the Section was held in Memphis on March 4, with about 50 members present. Elected officers for 1958-59 were:

Fenton G. Jordan, Jr.	President
William S. Derrick	Vice President
John T. Hanna	Secretary-Treasurer

Strong support was voiced for one of the Freeway Seminars, planned for this year or next, with an indication that Atlanta or vicinity would be a possible site for a seminar for late 1958 or early 1959.

The technical program, which was developed as part of the Southern Safety Conference program, featured three sessions.

Technical Session #1—was held on Monday afternoon. *Dave Dabney*, Traffic Engineer, Palmer & Baker, Mobile, Alabama, was the moderator. *Robert Barkley*, Director of Urban Renewal, Chattanooga Housing Authority, Chattanooga, Tennessee, spoke on the subject, "Chattanooga Adapts its Land Use Pattern to the Interstate System." *D. C. Brooks*, Regional Research Engineer, Bureau of Public Roads, Atlanta, Georgia, spoke on "Development of the Interstate System."

Technical Session #2—was held Tuesday morning. *W. H. Mann*, Traffic Engineer, Nashville, Tennessee, was the moderator. The first speaker was *R. K. Kimley*, Traffic Engineer, State of N. Carolina, Raleigh, N. C. He spoke on "Rural and Urban Highway Planning in North Carolina." The remainder of the program for Tuesday morning was devoted to a work shop with *Bill Mann* as moderator.

Technical Session #3—on Tuesday afternoon was moderated by *Robert Burch*, Traffic Engineer, State of N. Carolina, Raleigh, N. Carolina. The first speaker was *Carlton Robinson*, Traffic Engineer, Automotive Safety Foundation, Washington, D.C., who discussed "Traffic Operation on Limited Access Facilities and the Operational Impact on Adjacent Systems." Following this was a panel on "Problems of Expressways." This panel was composed of *H. K. Perkins, Jr.*, Traffic Engineer, City of Richmond, Virginia; *Charles A. Rose*, Asst. Traffic Engineer, Atlanta, Georgia, and *Edward A. Mueller*, Asst. Traffic & Planning Engineer, Florida State Road Department, Tallahassee, Florida.

WESTERN SECTION

Sacramento Area

1958 WITE CONVENTION BULLETIN—PROGRESS REPORT

The dates of the 1958 meeting have been changed—set back one day. The new dates are Wednesday, June 18th thru Friday, June 20th. The change was made to accommodate the second Regional Seminar on Freeway Operations which will be hosted by the Western Section and which will be held Monday and Tuesday, June 16 and 17 in Sacramento.

Convention headquarters will be the brand new Hotel El Dorado with its 1,500 capacity banquet room, Olympic-size heated (cooled in June) swimming pool, ample free parking space, air conditioned meeting rooms, etc. This is by far the best of the three mo-ho-tels recently completed in

(Continued on page 39)

Non-Reflectorized Pavement Markings . . .

HOW MANY LIVES WILL THEY COST TONIGHT?

The cost of reflectorizing pavement markings is extremely low . . . when you consider the lives that may be lost without it.

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CATATHERM REFLECTIVE PLASTIC STRIPING • TRAFFIC SIGNS • STREET NAME SIGNS

SYSTEMS ANALYSIS

(Continued from page 18)

vices which transmit information directly to a master controller. An economical arrangement allows triple resets, so three timing plans can be used: two for the peak-periods with unbalanced directional flows, and one for off-peak periods.

A much more expensive, but possible arrangement would have great flexibility under varying traffic conditions and be fully automatic. This arrangement would depend on the storage of reference information by electronic means. The output of "commands" back to the signals would result from a rapid processing of "field data" (the input) in accord with programs placed in the "memory" or storage unit of an automatic computer. (Whereas present vehicle-actuated devices are forms of analog computers, the more complex controller would have to incorporate a digital computer.)

While a fully automatic system may be some years away, consideration of the costs of excessive congestion in cities indicates the warrant for such an installation is already with us. On a less costly scale, however, traffic engineering activities in many cities are consistent with the trend toward route and area control. In Philadelphia, progressive timing on a grid of streets in the Germantown section has been in service for severay years.[11] In January 1957, Wilbur Smith and Associates reported to the City of Philadelphia on a plan for consolidation of signal controls—for over 300 central district intersections — into two integrated systems. Implementation of this ambitious plan is now underway by the Department of Streets.

Conclusion

The system concept, though not distinguished by a formal title, is already a part of transportation planning and traffic engineering in cities, particularly in the growing acceptance that major traffic problems in metropolitan areas cannot be solved individually, and that a general attack on traffic congestion requires study of all factors and modes and an ensuing detailed analysis to determine the most serviceable and efficient transport plant to move people and goods within a metropolitan area. However, transportation planning and traffic engineering can be greatly aided by *recognition of the formal system concept*, as advanced in other branches of engineering, through new methods for solution of broad circulation problems, and through particular mechanical means for control of traffic flow.

11 Lionel M. Rodgers, "A New Technique for Progressive Timing of Traffic Signals," **Traffic Engineering**, June 1955. Vol. 25, No. 9. pp. 357-360, 365.

Note: The writer takes responsibility for all statements and conclusions of this article, but wishes to thank the following persons for their helpful suggestions: Professors H. E. Davis, Mrs. Margy E. Meyerson, Mr. Richard Overmyer, Mr. John Rannells, and Dr. William L. C. Wheaton.

PEFORMANCE INDEX

(Continued from page 14)

formance Index should provide an objective measure of the service rendered the short-time parker under various rates, provided other variables—locations, convenience, etc.—are considered carefully.

The Index may also find application in specialized studies and research. Eventually, the Index may serve as an indicator of the need for corrective action to the traffic engineer, informing him when a facility is not performing satisfactorily and a change in parking control is needed.[7]

III *Recommendations for Further Development*

The Performance Index is, to the best of the writer's knowledge, a new idea. It must be reviewed critically and tested before its potential can be realized. Further development, perhaps by students and researchers at the graduate schools of traffic engineering or by an ITE technical committee, is needed to clarify various points:

- the optimum value for the exponent 'a'
- possible use of a correction factor to compensate for differences in the observation interval
- evaluation of the Index in terms of 'good', 'fair' or 'poor' performance.

Some parking facilities are designed specifically to meet the needs of the long-time or all-day parker. Fringe and commuter lots are examples. An index can possibly be developed to measure performance of the all-day parking facilities.

The mechanical engineer uses the concept of 'efficiency' in evaluating the performance of a piece of machinery. He qualifies the concept and prescribes exactly how efficiency is to be determined. With sufficient testing and refinement, the Performance Index may become a similarly useful tool for the traffic engineer in analyzing parking facilities.

7 ITE Committee 4-C, which recently completed its work of drafting Standards for Parking Meters, keenly felt the need of some quantitative measure for the condition when meter installation becomes desirable.

Positions Available

ST. PETERSBURG, FLORIDA

Position: Assistant Traffic Engineer.
Qualifications: Experience in technical traffic engineering or planning work. Graduation from a 4 year college or university with specialization in traffic engineering.
Salary: $411 to $520 per month.
Apply: L. D. Humes, Director, Civil Service, City Hall, St. Petersburg, Florida.

CHATTANOOGA, TENNESSEE

Position: Traffic Engineer to head survey and planning section of rapidly growing department.
Salary: $5400 to 6600 per year.
Information: Contact Marble J. Hensley, Director, Traffic & Planning, Room 215, City Hall, Chattanooga, Tennessee.

COUNTY TRAFFIC ENGINEER

Position: Traffic Engineer to head County Traffic Engineering Staff.
Requirements:
CE graduate with graduate work in traffic and a minimum of 1 year's experience in responsible charge of traffic engineering work. Duties will include traffic studies, plans for signals, signs, etc.
Apply: Mail brief resumé to Box 219, % TRAFFIC ENGINEERING, 2029 K Street, N. W., Washington 6, D. C. A formal application will be sent to those who qualify.

PEORIA, ILLINOIS

Position: Traffic Engineer. This is professional engineering work in the administration of the traffic engineering department in a city of 118,000.
Requirements: Graduate engineer with professional traffic engineering and supervisory experience.
Salary: $6526 to $8294 annually. Maximum salary obtainable through merit increases.
Apply: Reginald V. Sipfle, Personnel Officer, Room 209, City Hall, Peoria, Ill.

CONTRA COSTA COUNTY CALIFORNIA

Position: Assistant Traffic Engineer. Maintains responsibility for specific phases and studies of the traffic engineering program for the county.
Requirements: Degree in one of the major engineering fields plus two years of professional civil engineering experience including one year of traffic engineering. Traffic engineering experience may be substituted for education.
Salary: $519-$624 per month. Liberal vacation, sick leave and retirement plans, low cost group health insurance.
Apply: Contra Costa County Civil Service Commission, P.O. Box 710, Martinez, California.

SECTION NEWS

(Continued from page 36)

Sacramento and will provide a worthy site for the Western Section meeting.

A tentative program has been prepared and invitations are now in the mail to prospective participants in the technical sessions, the keynote speaker, and others. Arrangements are being made for a first class family social program and attractive events for the ladies.

Note the new dates (June 18-20) on your calendar now and—Watch for further details in next month's WesternITE.

* * *

Bay Area

Bob Glenn reports an attendance of approximately 550 at the 10th Annual Street and Highway Conference held at U.C.L.A., January 29-31. ITE members on the program included *Mel West, Harmer Davis, Sam Osofsky, Sam Taylor, John McDonald, Dud Stevens, Pete Koltnow,* and *Grant Mickle.*

The City of Richmond is conducting a limited O and D study. *Wallen* and *Robertson* report that this is an initial effort which will eventually be expanded into an extensive survey. The ultimate objective of these studies is to improve the downtown business area. The merchants in this area have formed a corporation to investigate methods of improving the commercial aspects of the downtown district.

University Extension is offering the "Fundamentals of Traffic Engineering" course again this spring semester. Encouraged by the large enrollment last fall, Extension has scheduled the course for Tuesday evenings in Berkeley. *Jim Kell* will be the instructor.

The ITTE Course Notes, *Fundamentals of Traffic Engineering* by Kennedy, Kell, and Homburger have been published by the University as Syllabus Series No. 371. These notes can be obtained from the Associated Students' Store (University of California, Berkeley 4, Calif.) for $3.00 plus 20 cents postage (California residents add 12 cents tax).

* * *

Washington Area

The many friends of *Gene Ireland* were indeed sorry to hear of the sudden demise of his wife, Ruth.

* * *

Oregon Area

Cooperation between Tom Yates of the Oregon Highway Computing Services Division and Bob Shindler of the Planning Survey Section has produced an IBM 650 computer program designed to perform various tabulating and computing operations required in the processing of truck axle weight data obtained monthly on the Baldock Freeway. The data consist of a 16-hour sample of truck axles weighed in motion by electronic scales on the freeway. The program adjusts coded sample weights through a table look up operation, constructs a frequency distribution by weight groups, expands to a monthly universe, adds prior data to produce cumulative totals. The entire program requires 20 minutes of computer time saving what formerly involved several man-days of tedious manual computations and checking. Since the program is adaptable to the needs of a variety of similar operations, duplicate copies can be made available on request.

It seems *Bruce Crandall* has been caught in the middle of a controversy involving the installation and spacing of "relief valves" on Oregon's freeways. The following reprint of an Oregon newspaper article lets us know which way the wind is blowing:

AUTOISTS TO LOSE EXCUSE FOR SPEEDING

Motorists will lose their excuse for speeding on the freeway soon. The State Traffic Safety Commission Wednesday heard that arrested motorists have told state police that they were hurrying to a restroom in Salem or Portland because there are none on the 48-mile Baldock Freeway. The Commission put itself flatly in favor of rest stops. State Traffic Engineer, F. B. Crandall said that such a facility now is being planned for the Wilsonville area after suggesting that the spacing of such units may be a more proper study for the State Board of Health rather than the State Highway Department.

* * *

Arizona-New Mexico Area

Chuck Haley has made public his very thorough and comprehensive "Scramble" survey.

212 questionnaires were sent and 152 answers were received. This was an excellent 72% return, showing a definite interest in the "Scramble System." Of the 152 cities answering, 42% of them are using the "Scramble System," 10% have tried it and discontinued it and 48% are not using it. Twenty-six cities reported that the city was "pressured" into using the system against the advice of those in control of traffic.

Also included in the report are the written comments of persons answering the survey. The comments range from a bitter denunciation of the "Scramble System" to a complete satisfaction with it. The consensus of the comments is that the system should be used only after considerable study.

Anyone interested in a copy of the complete report, just drop *Chuck Haley* a line and he will be happy to comply.

* * *

San Diego Area

The California Division of Highways in the San Diego Area is fast going out of the traffic signal business. Four signalized intersections were replaced by interchanges last year, three are presently under construction and three more interchanges will be under way before this year is over.

During this same period of time, they will have installed only one new traffic signal. At this rate of change over, it won't be long before the drivers of the State Highways in Metropolitan San Diego will not be subjected to the delays and accident potentials of signals at grade intersections.

There is at present 14 million dollars worth of freeway and interchange construction under contract in the San Diego area.

* * *

Intermountain Area

It was learned that *Al Pepper* was re-elected for another term as Secretary of the Official Committee, Colorado Highway Safety Council. This Committee is the policy group for the coordination of traffic safety activities in the State, and the seven major Department Heads responsible for the allied phases of traffic safety are members of the Committee by Law. Although this is another one of the extracurricular activities all Traffic Engineers draw, as a lot of you will remember, Al has always been a strong advocate of inter-relating traffic engineering techniques with enforcement and motor vehicle administration policies. This, then, becomes one more means of gaining public support for our endeavors.

Lew Ross, former Design Engineer of the Idaho Department of Highways, has been appointed to fill the newly created position of Planning Engineer in the Traffic and Planning Division. Lew will handle the functions of advance planning studies and programming for the Department.

Gene Burbidge of the Planning Survey has been busy as a beaver working up a comprehensive traffic study of the Boise valley. This study is to determine the most desirable routing for the Interstate through this area.

Idaho has another prospective ITE member. Dean Tisdale, former District No. 2 Design Engineer has been transferred to the Planning and Traffic Division. Dean is presently working on an economic evaluation to determine the most desirable routing for the Interstate through the Jerome, Twin Falls area.

Reference Notes

TRAFFIC ENGINEERING EDUCATION

A report of a subcommittee of Technical Committee 2C of the Institute of traffic Engineers, approved by the Technical Council and the Board of Direction for publication.

Summary of Findings

1. In the 1956-1957 school year there were 1,125 undergraduate students in 45 accredited civil engineering schools enrolled in one or more traffic engineering courses.
2. Finding 1, above, was an increase of 75 per cent in students and 55 per cent in schools since the school year of 1954-1955.
3. In the 1956-1957 school year there were 296 graduate students in 29 accredited civil engineering schools enrolled in one or more traffic engineering courses.
4. Finding 3, above, was an increase of 77 per cent in students and 32 per cent in schools since the school year of 1954-1955.
5. In the 1956-1957 school year there were 126 graduate students whose principal field was traffic engineering or highway transportation.
6. Undergraduate students in traffic engineering courses represent 25 per cent of the senior civil engineering students enrolled in accredited schools.
7. Graduate students in traffic engineering courses represent 14 per cent of the graduate civil engineering students enrolled in accredited schools.
8. Of the 68 instructors listed as being in charge of traffic courses (in schools offering one or more such courses) 15 are members of the Institute of Traffic Engineers.

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Method

The 1956-1957 data were obtained from a questionnaire mailed to each of the 127 schools accredited in civil engineering by the Engineers Council for Professional Development. The questionnaire and instruction sheet are shown in the appendix.

The 1954-1955 data were obtained from a survey conducted by the ITE staff two years ago.[1]

Replies were received from 88 per cent of the schools representing 93 per cent of the 1956 civil engineering graduates.[2] In the following tables, *estimates have been inserted* for those schools not replying.

In addition, 35 schools *not* accredited by E. C. P. D. which represent 7.9 per cent of the civil engineering Bachelors degrees granted in 1956 were not contacted.

The courses considered in the following tabulations are only those reported as *devoted 50 per cent or more to traffic engineering subjects.* This led to some ambiguity when the same course was reported in the two surveys with different percentages of traffic engineering material. These discrepancies have been noted in the tables and the reported percentage has been accepted without change.

Courses listed as "senior or graduate" have been considered as undergraduate courses and all students have been listed as undergraduate students.

At schools reporting more than one course in traffic engineering, the number of students reported in the highest single enrollment has been listed. This presumably results in an underestimate of the total students.

Tables

(shown on pp. 42, 45, 46 and 48)

1. Schools Reporting Undergraduate Courses in Traffic Engineering, 1956-1957 and 1954-1955.
2. Schools Reporting Graduate Courses in Traffic Engineering, 1956-1957 and 1954-1955.
3. Professors in Charge of Traffic/Highway Courses at Accredited Civil Engineering Schools, 1956-1957.

1 MAY, A. D., Jr., "Status of Traffic Engineering Education," **Traffic Engineering**, Institute of Traffic Engineers, 2029 K Street N.W., Washington 6, D.C., Volume 27, No. 8, May, 1957.

2 **Engineering Enrollments and Degrees, 1956**, Circular No. 494, U. S. Office of Education, 1957, U. S. Government Printing Office, Washington 25, D.C.

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3-PHASE FULL VEHICLE ACTUATED CONTROLLER

COMBINES 6 BIG BENEFITS

Here — from Eagle — is an electronic controller of simple design, providing full or semi-actuated control of intersections where traffic must be dispatched in three movements. In the absence of traffic demand, any movement may be skipped. Time extension is provided to all three movements. It may be coordinated in any pretimed control system to greatly increase efficiency at a "bottleneck" intersection.

Advanced engineering design makes it possible to combine highly accurate timing and flexible operation with a number of features of definite advantage. For complete specifications, fill out and mail coupon today.

★ **No High Voltage — Simple 6 and 12 volt Transformer.**

★ **Heavy Duty Light Relays — No External Load Relays Required.**

★ **Heavy Duty Relays in Phase Overlap and other auxiliary units — No External Load Relays Required.**

★ **Compensated circuit — Timing does not vary with Tube Change. Tubes are standard and commercially available.**

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NAME AND TITLE

ORGANIZATION

FULL ADDRESS

TABLE I

SCHOOLS REPORTING UNDERGRADUATE COURSES IN TRAFFIC ENGINEERING

1956-1957 and 1954-1955

SCHOOL	PROFESSOR	1956-1957 Courses	1956-1957 Students	1954-1955 Courses	1954-1955 Students
BROOKLYN POLY.	Louis J. Pignataro[1]	Rc[2]	45[3]		
CALIFORNIA	W. Kennedy/R. Moyer			a[2]	18[3]
CARNEGIE TECH.	T. E. Stelson	Rb	55		
CINCINNATI	Robert T. Howe	Rc	15	X	
COLORADO	Roderick L. Downing	a	--		
CONNECTICUT	Jack E. Stephens	Rb	20	X	
CORNELL	Taylor D. Lewis	a	24		
DETROIT	K. D. Cummins	Rc	35	X	
DREXEL	R. P. Haurich	X		Rc	30
FLORIDA	W. H. Zimpfer	a	--		
GEORGIA TECH.	Radnor J. Paquette	Rc	46	X	
ILLINOIS	John E. Baerwald	Ra	44	a	24
IOWA STATE	Ladis H. Csanyi	a	10	a	12
JOHNS HOPKINS	J. T. Thompson	b	10	b	22
KANSAS STATE	R. N. Shaw	Rb	45	X	
KANSAS	T. F. McMahon	a	21	a	10
LEHIGH	R. L. Schiffman			b	--
MASSACHUSETTS	William W. Boyer	b	9	b	9
MICHIGAN STATE	Adolf D. May, Jr.	a	15	2a-2rb	60
MICHIGAN	John C. Kohl	2a	19	2a-b-c	20
MINNESOTA	T. W. Thomas	a-c	14	a-c	20
MISSISSIPPI STATE	O. K. Anderson	Ra	39	X	
MISSOURI	Howard E. Irby	a	20		
MONTANA STATE	O. I. Jackson	b	5	X	
NEW HAMPSHIRE	R. R. Skelton	Rc	24	Rc	15
NEW MEXICO*	M. C. May	Rc	21	Rc	21
NEW YORK CITY	Joseph Pistrang	Rc	50	Rb	80
N. CAROLINA STATE	John W. Horn	Rb	95	Rb	75
NORWICH	L. M. Kidd	Rb	23		
OHIO STATE	Emmett Karrer			a	38
OKLAHOMA	Joe Keeley	Ra	15	a	15
OREGON STATE	M. P. Coopey	Rc	50	Rc	10
PENNSYLVANIA STATE	C. G. Reen	a	8		
PRINCETON	P. Kissam	X		Rc	14
PURDUE	H. Michael/K. B. Woods	a-d	14		

TOUGH TRAFFIC-TESTED plastic

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TRAFFIC MARKERS, STRIPS, ARROWS

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ONE-PIECE TRAFFIC LETTERS *

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Rigorous traffic tests in many cities throughout the country continue to prove that plastic is the longest lasting modern material for the heavy traffic conditions of today. These conclusive tests also show that NEFSLABS and NEFMATS are the finest plastic traffic marking products available. You are invited to enjoy their trouble-free performance.

FOR LOW ANNUAL COST
Why repaint traffic lines twice a year or more? Use extra long-life NEFSLABS and NEFMATS to save many costly repainting jobs through the years. The service of these tough plastic products is measured in **years,** not merely in weeks. Their permanency vastly reduces bothersome traffic bottlenecks . . . saves time, workmen, and scheduling headaches.

FOR EASY APPLICATION
Quickly applied by spray gun or brush, NEFSLABS and NEFMATS bond securely with our cold, fast-drying adhesive.

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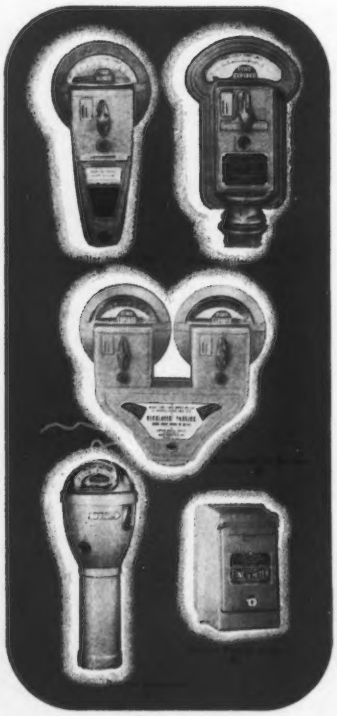

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More municipalities everywhere are daily being included among the many satisfied users of DUNCAN-MILLER meters.

DUNCAN-MILLER . . . the world's leading manufacturer of parking control units is predominantly preferred in cities throughout Canada, Australia, New Zealand and the United States as well as in most foreign countries.

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Manufacturers of fully automatic and manual parking meters.

Table I

(Continued)

SCHOOL	PROFESSOR	1956-1957 Courses	1956-1957 Students	1954-1955 Courses	1954-1955 Students
RENSSELAER	H. O. Sharp	b	28	b	10
ROSE	T. A. Duwelius	c	--	c	20
SANTA CLARA	Myron Jacobs	a	2	c	13
S. DAKOTA MINES	Alfred C. Scheer	b	12		
STANFORD	C. H. Oglesby	Rb	36	X	
TEXAS A & M	Charles J. Keese	a-c	81	a	20
UNION	C. T. Male, Jr.	X		Rc	18
UTAH STATE	William A. Cordon	a	14		
UTAH	P. D. Linford	Rc	25		
VERMONT	Stephen C. Knight, Jr.	X		Rb	12
VIRGINIA MILITARY	S. S. Gillespie	Rc	55	X	
VIRGINIA POLY.	R. Brinker/J. Schaub	a	16		
WASHINGTON STATE	Elvin G. Ericson	a	12		
WASHINGTON (St. Louis)	W. W. Schenler	Rc	25	Rc	18
WASHINGTON	Roy B. Sawhill	a-d-c	48	a-d	18
WAYNE	John C. Partyka	a	--	a-c	10
WISCONSIN	Lloyd F. Rader	a	6	a	13
OKLAHOMA STATE	Moreland Herrin	c	12		

NOTES FOR TABLES I & II

* Did not reply to questionnaire--figures are estimated from other sources.

(1) The professor listed as in charge of traffic or highway courses.

(2) a - courses titled Traffic Engineering or devoted 100 per cent to Traffic Engineering.
b - courses titled Transportation devoting approximately 75 per cent to Traffic Engineering.
c - courses titled Highways or Design devoting at least 50 per cent to Traffic Engineering.
d - courses titled Highway Planning or Administration devoting at least 50 per cent to Traffic Engineering
R - required for graduation in some or all cases
X - same course reported as other survey but with less than 50 per cent T.E.

(3) Undergraduate and graduate students in courses listed.

TABLE II

SCHOOLS REPORTING GRADUATE COURSES IN

TRAFFIC ENGINEERING

1956-1957 and 1954-1955

SCHOOL	PROFESSOR	1956-1957 Courses	1956-1957 Students	1954-1955 Courses	1954-1955 Students
ARIZONA	D. J. Hall	a	2	a-c	2
BROOKLYN POLY.	Louis J. Pignataro	a-c-2d	20	a-d	15
CALIFORNIA	W. Kennedy/R. Moyer	2a-c-d	10	2a-c-d	14
CORNELL	Taylor D. Lewis	a-c	12	2a-c	20
DREXEL	R. H. Pearson	2a	36		
GEORGIA TECH.	Radnor J. Paquette	a-b	7	2a	10
IDAHO	C. A. Moore	b	2		
ILLINOIS	John E. Baerwald	4a-c-2d	8	2a-c-d	5
IOWA STATE	Ladis H. Csanyi	2c	8		
KENTUCKY	A. L. Chambers	c	6	c-d	9
MARYLAND	Blackburn/Barber	2c	2		
M. I. T.	A. J. Bone	a-c	9	a-c	13
MICHIGAN STATE	Adolf D. May, Jr.	a-c-d	4	4a	4
MICHIGAN	John C. Kohl	a	3	a-c-d	--
MISSOURI	Howard E. Irby			b	--
NEW YORK	T. T. Wiley	a	20		
N. CAROLINA STATE	John W. Horn	4b	3	2b-c-d	2
N. DAKOTA STATE	John A. Oakey	a	1	a	1
NORTHWESTERN	D. S. Berry	3a-c-d	7	a	8
OHIO STATE	Emmett H. Karrer	2a-d	26	a-c	--
OKLAHOMA A & M*	Moreland Herrin	b	6	b	6
OREGON STATE	M. P. Coopey			a	3
PURDUE	H. Michael/K. Woods	a-c-d	18		
RHODE ISLAND	Kendall Moultrop	a	17		
RUTGERS	A. R. Jumikis	a	--		
STANFORD	C. Oglesby	X		b	3
TEXAS A & M	Charles J. Keese	a-3c	6		
TEXAS	John A. Focht	a	8		
TUFTS	P. A. Dunkerley	a	1		
UTAH	P. D. Linford			a-b-2c-d	18
VIRGINIA	T. E. Shelburne	a	--	a	--
WAYNE	John C. Partyka			a-c	3
WISCONSIN	Lloyd F. Rader	2a	12		
YALE BUREAU	Fred Hurd	7a	42	7a	31
WASHINGTON	Martin Ekse	c	5		

NOTE: See Table I for explanation of symbols.

800 BALTIMORE Traffic Signals Electronically Coordinated

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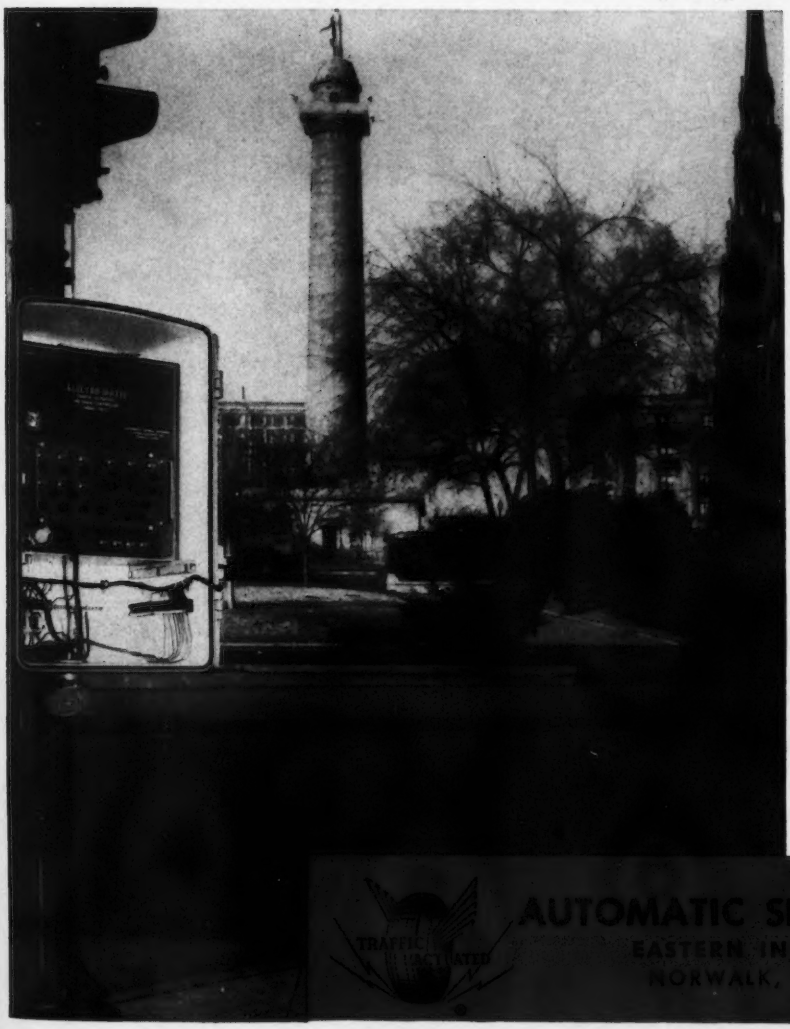

There's something noticeably new in Baltimore — traffic moves, and in orderly fashion, too. In a few short years, Transit-Traffic Commissioner Henry A. Barnes, has turned Baltimore, which had been called "the city with the most antiquated signal system of its size," into a city that boasts the most modern, efficient signal system obtainable.

Baltimore's PR System is an advanced combination of modern electronics. Radar Detectors are used to sample key traffic flows for the centrally located battery of Electro-Matic Masters shown above. The highly developed computing circuits of the Masters analyze this flow data and send to the 800 all-electronic PR Locals throughout the city the necessary instructions to set up the most effective timing pattern for traffic conditions of the moment.

For details write for Bulletin E-224B.

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NORWALK, CONNECTICUT

TABLE III

PROFESSOR IN CHARGE OF TRAFFIC/HIGHWAY COURSES AT

ACCREDITED CIVIL ENGINEERING SCHOOLS

1956-1957

SCHOOL	PROFESSOR	GRADUATING SENIORS	GRADUATE STUDENTS
AKRON	Duane R. Keller	9(1)	0(2)
ALABAMA POLY.	A. S. Chase	48	7
ALABAMA	J. M. Faircloth	25	4
ARIZONA	D. J. Hall	32	1
ARKANSAS	L. W. Mahone	5	5
BROOKLYN POLY.	Louis J. Pignataro	57	130
BROWN	W. R. Benford	5	0
BUCKNELL	Roger J. Claus	12	1
CALIFORNIA TECH.		7	15
CALIFORNIA	W. N. Kennedy/R. A. Moyer	120	95
CARNEGIE TECH.	T. E. Stelson	37	15
CASE*	O. M. Mintzer	30	31
CINCINNATI	Robert T. Howe	15	0
CITADEL	J. C. Myers	26	0
CLARKSON	Arthur Straub	27	0
CLEMSON	J. P. Rostron	30	2
COLORADO STATE	Milton E. Bender, Jr.	24	35
COLORADO	Roderick L. Downing	56	14
COLUMBIA	N. S. Fisk	75	30
CONNECTICUT	Jack E. Stephens	22	18
CORNELL	Taylor D. Lewis	43	33
COOPER UNION*	J. O. Eichler	19	0
DARTMOUTH	S. R. Stearns	10	7
DAYTON*	E. J. Baldinger	10	0
DELAWARE	R. J. Leonard	16	16
DENVER*	D. O. Van Strein	18	3
DETROIT	K. D. Cummins	35	0
DREXEL	R. P. Haurich	40	29
DUKE	J. W. Williams	25	2
FENN*	F. J. Gallp	19	0
FLORIDA*	W. H. Zimpfer	38	12
GEORGE WASHINGTON	R. L. Hardy	15	0
GEORGIA TECH.	Radnor J. Paquette	42	30
HOWARD	L. K. Downing	9	0
IDAHO	C. A. Moore	26	2
ILLINOIS TECH.	E. Vey	40	0
ILLINOIS	John E. Baerwald	100	152
IOWA STATE	Ladis H. Csanyi	60	60
IOWA	John O'Mara/R. J. Wheeler	35	30
JOHNS HOPKINS	J. T. Thompson	10	8
KANSAS STATE	R. N. Shaw	31	3
KANSAS	T. F. McMahon	35	7
KENTUCKY	A. L. Chambers	90	20
LAFAYETTE*	R. Moyer	18	0
LEHIGH		40	50
LOUISIANA POLY.	J. T. Painter	23	0
LOUISIANA*		22	29
LOUISVILLE	W. R. McIntosh	12	3
MAINE	W. S. Evans	35	2
MANHATTAN	B. Austin Barry	62	0
MARQUETTE	O. N. Olson	50	0
MARYLAND	Blackburn/Barber	32	5
M. I. T.	A. J. Bone	48	85
MASSACHUSETTS	William W. Boyer	30	4
MICHIGAN TECH.	T. H. Barrett	70	3
MICHIGAN STATE	Adolf D. May, Jr.	44	12
MICHIGAN	John C. Kohl	78	74
MINNESOTA	T. W. Thomas	32	63
MISSISSIPPI STATE	O. K. Anderson	49	3
MISSISSIPPI	Tom W. Stallworth	15	2
MISSOURI MINES	Leon Hershkowitz	63	11
MISSOURI	Howard E. Irby	12	10
MONTANA STATE	O. I. Jackson	23	2
NEBRASKA	A. R. Legault	33	3
NEVADA	H. B. Blodgett	18	2
NEWARK	L. Shapiro	32	30
NEW HAMPSHIRE	R. R. Skelton	24	0
NEW MEXICO A & M	O. C. Payne	12	6
New Mexico*	M. C. May	24	15
NEW YORK CITY	Joseph Pistrang	80	25
NEW YORK	T. T. Wiley	30	65
N. CAROLINA STATE	John W. Horn	75	14
NORTH DAKOTA STATE	John A. Oakey	28	3
NORTH DAKOTA	Stanley S. Johnson	25	6
NORTHEASTERN	Coleman	80	40
NORTHWESTERN	D. S. Berry	5	5
NORWICH	K. M. Kidd	19	17
NOTRE DAME	R. Plummer	20	5
OHIO NORTHERN	M. V. Pothier	13	0
OHIO STATE	Emmett H. Karrer	45	10
OHIO	George W. Clark	24	0
OKLAHOMA STATE	M. Herrin	22	13
OKLAHOMA	Joe Keeley	25	8
OREGON STATE	M. P. Coopey	50	2
PENNSYLVANIA STATE	C. G. Reen	93	18
PENNSYLVANIA*	D. T. Harroun	13	48
PITTSBURGH*		27	28
PRINCETON	P. Kissam	14	12
PURDUE	H. L. Michael/K. Woods	110	100
RENSSELAER	H. O. Sharp	75	24
RHODE ISLAND	Kendall Moultrop	26	1
RICE	L. B. Ryon	11	1
ROSE	T. A. Duwelius	10	0
RUTGERS	A. R. Jumikis	11	1
SANTA CLARA	Myron Jacobs	18	0
SOUTH CAROLINA*	C. R. McMillan, Jr.	21	0
SOUTH DAKOTA MINES	Alfred C. Scheer	28	0
SOUTH DAKOTA STATE	Emory E. Johnson	26	4
S. W. L. A. Inst.*		7	0
SOUTHERN CALIFORNIA		62	113
SOUTHERN METHODIST	H. H. Bartel, Jr.	17	25
STANFORD	C. H. Oglesby	40	50
SWARTHMORE		7	0
TENNESSEE	E. C. Shreve	42	11
TEXAS A & M	Charles J. Keese	75	37
TEXAS TECH.	C. T. Overby	20	0
TEXAS	John A. Focht	70	33
TOLEDO*		10	0
TUFTS	P. A. Dunkerley	25	0
TULANE	F. H. Fox	12	18
UNION	C. T. Male, Jr.	10	0
UTAH STATE	William A. Cordon	40	8
UTAH	P. D. Linford	20	4
VANDERBILT	W. D. Glenn	30	0
VERMONT	Stephen C. Knight, Jr.	6	0
VILLANOVA	Richard Miller	33	0
VIRGINIA MILITARY	S. S. Gillespie	53	0
VIRGINIA POLY.	R. Brinker/ J. Schaub	40	17
VIRGINIA	Tilton E. Shelburne	18	3
WASHINGTON STATE	Elvin G. Ericson	40	3
WASHINGTON (St. L.)	W. W. Schenler	25	10
WASHINGTON	Roy B. Sawhill	76	35
WAYNE	John C. Partyka	12	54
WEST VIRGINIA	W. H. Baker	20	0
WISCONSIN	Lloyd F. Rader	56	72
WORCESTER*		10	0
WYOMING	J. H. Zoller	40	6
YALE	R. P. Vreeland	18	20
YALE BUREAU	Fred Hurd	0	42

NOTES FOR TABLE III

* Did not reply to questionnaire--figures are estimated from other sources.

(1) Senior Civil Engineering Students reported graduating in Spring, 1957.

(2) Graduate Civil Engineering Students enrolled, Spring, 1957.

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(1) Strengthen the nation's dedication to the rule of law as the foundation of our free society, and

(2) Freshen our individual awareness of the rights and privileges we enjoy by reason of our system of laws and courts.

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INSTITUTE AFFAIRS

(Continued from page 32)

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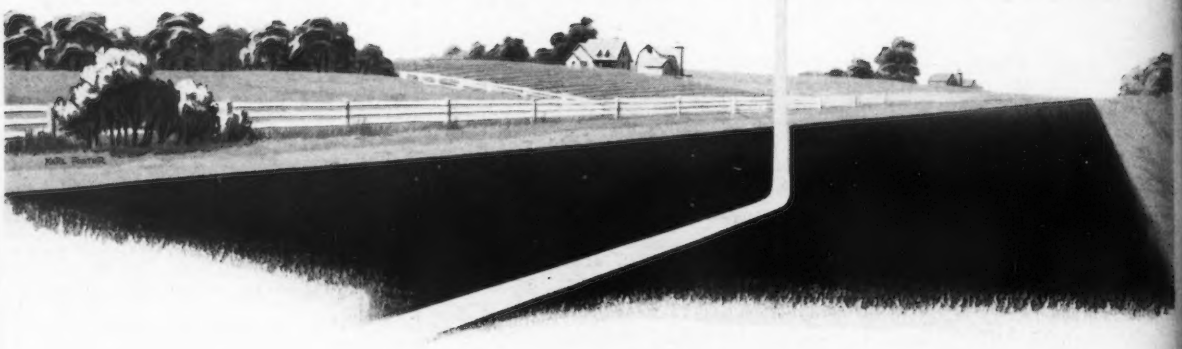

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